Wolf
Management Report
of survey-inventory activities
1 July 1999–30 June 2002

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Alaska Department of Fish and Game
Division of Wildlife Conservation
December 2003

ADF&G

Please note that population and harvest data in this report are estimates and may be refined at a later date.

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If used in part, the reference would include the author's name, unit number, and page numbers. Authors' names and the reference for using part of this report can be found at the end of each unit narrative.

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Alaska Game Management Units

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNIT: 18 (41,159 mi^2)

GEOGRAPHIC DESCRIPTION: Yukon–Kuskokwim Delta

BACKGROUND

Wolf numbers were low throughout Unit 18 from the demise of reindeer herding in the 1930s (Calista 1984) until the late 1980s when moose populations became established. Observations from trappers, hunters, fur buyers, and agency biologists indicate that wolf numbers have increased in Unit 18, particularly along the main stem of the Yukon River and in the Kilbuck Mountains east of Bethel. The distribution and abundance of wolves in Unit 18 reflect the expanding distribution and increased abundance of moose and caribou of the last decade. The reported wolf harvest continued to increase during this reporting period.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Maintain viable wolf populations in Unit 18
- Minimize adverse interactions between wolves and the public
- Develop updated population management objectives for Unit 18

MANAGEMENT OBJECTIVES

- Monitor wolf population status through contacts with the public, annual trapper questionnaires, and field observations
- Monitor harvests through the sealing program and public contacts
- Explain regulations to local hunters and trappers and promote compliance with them
- Provide general wolf information and education to the public
- Consult with the public and other agencies regarding updated wolf population management objectives

METHODS

We observed wolves and wolf tracks during aerial and boat-supported surveys for other species and sent a questionnaire that included questions regarding wolves to area trappers. We also discussed wolves with other agency personnel, fur buyers, trappers, hunters, local pilots and other residents. One particularly successful wolf trapper provided many valuable insights.

We collected harvest information from sealing records and increased our support for license vendors and fur sealers in Unit 18 by recruiting an administrative clerk whose responsibilities include recruiting and supporting license vendors and fur sealers. We sent public notices with information regarding fursealing requirements to Unit 18 villages and provided the local newspaper with regular informational articles on topics such as wolves, trapping, and regulations.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We did not conduct surveys to determine the status of wolves in Unit 18. Our population size estimate (Table 1) is based on the increasing trend in reported harvest (Figure 1); trapper questionnaire data which include observations of animals, tracks, concentrations of activity; reported sightings; other reports by the public; and anecdotal information.

Trapper questionnaire respondents indicated that wolves were common and increasing during this reporting period. We agree with this assessment and inferred that the 1999 population ranged from 200–225 animals in 18–22 packs, and grew to 250–300 animals in 25–30 packs (Table 1) by the end of the reporting period.

Population Composition

We have no survey data or other information to determine the composition of the wolf population in Unit 18.

Distribution and Movements

During the previous reporting period, we reported wolves present along the entire length of the Yukon River upstream of the delta. Packs are now established within the Yukon Delta and throughout the Yukon River riparian corridor. There is at least one resident pack along the Kuskokwim River near Lower Kalskag. The distribution of these packs follows the distribution, population growth, and range expansion of moose in Unit 18.

Wolves occupy the Kilbuck Mountains from the area near Whitefish Lake to the southernmost tip of Unit 18 near Cape Newenham. These wolves prey predominantly on caribou and their distribution probably changes with caribou availability. Some resident wolf packs remain throughout the year but when caribou return to Unit 17 to calve these packs are left with very little prey.

We occasionally encounter wolves on the tundra between the Kuskokwim River and the Yukon River riparian corridors but these wolves are probably transient. We do not know of any established packs in this area.

MORTALITY

Harvest

Season and Bag Limit.

Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 18		
RESIDENTS & NONRESIDENTS:		
Trapping - no limit	10 Nov–31 Mar	10 Nov–31 Mar
Hunting - 5 wolves	10 Aug–30 Apr	10 Aug–30 Apr

Board of Game Actions and Emergency Orders. There were no Board of Game actions regarding wolves for Unit 18 during this reporting period.

Hunter Harvest. Sealing certificate data indicate the following wolf harvest for Unit 18: 85 during the 1999–2000 regulatory year, 31 in 2000–2001, and 109 in 2001–2002 (the highest reported harvest to date). The highest harvest during the decade preceding this reporting period was 17 in 1988–1989 and the average harvest was 7 from 1984–1985 through 1995–1996. Clearly, recent harvests have increased dramatically (Figure 1).

Since 1996–1997, 81% of the harvest occurred in the Kuskokwim River drainage (Table 2). This reflects the distribution of caribou and caribou hunters who opportunistically shoot wolves (Table 3). It also reflects the trapping activity of one particularly successful trapper, active within the drainages of the Kuskokwim River, who was responsible for 30% of the Unit 18 wolf harvest during this reporting period.

Male wolves are more vulnerable to harvest than females. From 1985–1986 through this reporting period, there were many more males (n = 217) taken than females (n = 126) in Unit 18 (Table 3).

These data are derived from sealing certificates and represent a minimum estimate of wolf harvest. Many wolves caught in Unit 18 are neither sold nor sealed. Wolf ruffs are highly prized as parka trim, and the local domestic demand for wolf pelts is very high. Local residents generally prefer stiffer home-tanned wolf pelts for parka ruffs. In 2001–2002, a local Fish and Wildlife Protection officer sealed 16 of the 24 wolves taken by Quinhagak residents. Many of these wolves would not have been reported had the officer not made an extraordinary effort. This supports our prediction that many wolf pelts are habitually not sealed.

Permit Hunts. There were no permit hunts for wolves in Unit 18 during this reporting period.

Hunter Residency and Success. Alaska residents harvested all of the wolves taken during this reporting period. Only one successful resident, who shot a wolf in August, resided outside Unit 18.

No measure of success is available.

Harvest Chronology. The highest reported harvests have historically been in February; the second highest have been in March (Table 4). During this reporting period there was also a high harvest in January. This pattern is explained by the usual timing of snow accumulation and the improvement in travel conditions. Trapping is hampered by low snow, alternating freezing and thawing temperatures, and few hours of daylight. The intensity of caribou hunting and the subsequent incidental harvest of wolves are also dependent upon travel conditions. Travel conditions usually improve by January and through February. The 2000–2001 harvest was 31, the lowest during this reporting period. Travel conditions remained poor through most of the season and explain the lower harvest.

Transport Methods. Hunters and trappers typically use snowmachines to harvest wolves. One hunter used a boat in August 2000, but this is rare.

Other Mortality

No information is available on natural mortality of wolves in Unit 18.

HABITAT

Assessment

Extensive riparian, upland, and tundra habitats are available in Unit 18 to support much larger populations of moose, caribou, and muskoxen. Increased numbers of moose and caribou in the Yukon and Kuskokwim drainages have already resulted in an increase in the number of wolves in Unit 18 compared to the 1980s. However, there are still large areas of vacant habitat suitable for moose, caribou, and muskoxen. As these habitats are utilized by ungulates, wolf populations will benefit.

Enhancement

There were no direct habitat enhancement activities for wolves in Unit 18 during the reporting period. However, we have made progress toward improving moose populations through two separate public planning processes. As moose populations increase, wolf habitat will be enhanced.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

There were no nonregulatory management problems or issues associated with wolves in Unit 18 that were identified during the reporting period.

CONCLUSIONS AND RECOMMENDATIONS

Wolf numbers continue to increase in Unit 18 in response to greater availability of ungulates. Moose along the Yukon River have increased in numbers and range to the point that wolf packs are established from the Unit 18 boundary at Paimiut all the way to the Yukon River Delta. Wolves have also increased in the Kilbuck Mountains in response to a seasonal influx of caribou. Some resident wolf packs have become established in the Kilbuck Mountains, but because there is so little prey available after caribou leave, we surmise that most of the wolves that use the eastern portion of Unit 18 leave the unit as caribou leave.

The current population for Unit 18 is about 250–300 wolves in 25–30 packs including wolves that use adjacent game management units when caribou are not available in Unit 18. This represents an increase of about 100 wolves since the previous reporting period. However, the growing ungulate population in Unit 18 is capable of supporting the larger wolf population.

The reported harvest of 109 in 2001–2002 was the highest recorded for Unit 18. This is due to a growing wolf population, good snow conditions allowing easy snowmachine travel, caribou being available to a large number of Kuskokwim River residents, and better harvest reporting. It also reflects the efforts of one particularly accomplished trapper.

The reported harvest of 31 in 2000–2001 does not follow the trend of increasing harvests of the last decade (Figure 1). This lower harvest reflects poor travel conditions and illustrates the impact of poor weather on harvest.

Current ungulate management strategies and planning efforts in Unit 18 are designed to increase caribou, moose, and muskox populations and one result of increasing these populations is increased availability of prey for wolves. Excessive human harvest is the principal factor limiting ungulate population growth in Unit 18, particularly with respect to moose along the Kuskokwim and muskoxen colonizing the mainland. For these ungulate populations to grow and become established, residents must be willing to accept hunting restrictions. However, residents also point to wolves as part of the problem contributing to low ungulate populations. For our public planning efforts to be accepted, wolves may need to be harvested at sufficiently high levels to assure minimal predation. The current harvest levels are appropriate.

The regulations are poorly understood by many wolf hunters, particularly those who take wolves opportunistically. Some hunters use snowmachines to take wolves illegally. Wolf pelts are frequently presented for sealing after the sealing deadline has passed, and many of these are sealed by someone other than the hunter or trapper. Typically, these pelts are given as gifts to skin sewers, frequently elderly women, who discover the need to seal pelts when they are presented for tanning. We routinely seal these furs as requested and use this as an opportunity to educate the public about the sealing regulations. We have asked the fur sealers to direct people with illegal pelts to us so we have the opportunity for education and can get harvest data. We recommend continuing this practice.

We recruited an administrative clerk whose duties include recruiting, educating, and supporting license vendors and fur sealers. This should result in better compliance with our

regulations, higher retention of better trained fur sealers and license vendors, and better harvest information.

LITERATURE CITED

CALISTA PROFESSIONAL SERVICES AND ORUTSARARMUIT NATIVE COUNCIL. 1984. Prospects for reviving the reindeer industry in the Yukon–Kuskokwim region. 178pp.

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Table 1 Unit 18 fall wolf population estimates[a], 1985–1986 through 2001–2002

Regulatory year	Population	Packs
1985–1986	25–50	5–7
1986–1987	25–50	5–7
1987–1988	25–50	5–7
1988–1989	50–75	6–7
1989–1990	50–75	6–7
1990–1991	75–100	6–7
1991–1992	75–100	6–7
1992–1993	75–100	6–7
1993–1994	75–100	6–7
1994–1995	75–100	6–7
1995–1996	75–100	8–10
1996–1997	75–100	10–15
1997–1998	100–150	12–18
1998–1999	150–200	15–20
1999–2000	200–225	18–22
2000–2001	225–275	22–27
2001–2002	250–300	25–30

[a]The basis for this estimate comes from incidental observations, reports from the public, sealing records, and trapper questionnaire results.

Table 2 Unit 18 wolf harvest, Yukon vs. Kuskokwim drainages, 1996–1997 through 2001–2002

Regulatory year	Yukon	Kuskokwim	Unknown	Total
1996–1997	5	24	11	40
1997–1998	6	37		43
1998–1999	13	32		45
1999–2000	10	75		85
2000–2001	3	28		31
2001–2002	20	89		109

Table 3 Unit 18 wolf harvest, 1985–1986 through 2001–2002

Regulatory	Reported harvest			Method of take			Number successful
Year	M	F	Unknown	Trap/Snare	Shot	Unknown	trap/hunt
1985–1986	1		6	6	1		2
1986–1987	2		2		2	2	2
1987–1988	4	4	3	5	5	1	6
1988–1989	11	6					7
1989–1990	2	2					2
1990–1991	1			1			1
1991–1992	2	2		4			2
1992–1993	0	0	7	0		7	-
1993–1994			6			6	-
1994–1995	3		3	4	2		4
1995–1996	6	2	6	5	1	8	3
1996–1997	9	17	14	17	11	12	-
1997–1998	29	7	7	27	11	5	10
1998–1999	24	13	8	23	22		18
1999–2000	52	23	10	44	41		23
2000–2001	17	9	5	15	13	3	17
2001–2002	54	41	14	51	52	6	34

Table 4 Unit 18 wolf harvest chronology by time period, 1985–1986 through 2001–2002

	Harvest period						
Regulatory year	Nov	Dec	Jan	Feb	Mar	April	*N*
1985–1986	6	1					7
1986–1987		2					4[a]
1987–1988		1	5	3	2		11
1988–1989		5	1	4	7		17
1989–1990			1	1	2		4
1990–1991				1			1
1991–1992					4		4
1992–1993							7[a]
1993–1994			2		2		6[a]
1994–1995		4		1	1		6
1995–1996	1			6	1		14[a]
1996–1997	2	5	4	17			40[a,b]
1997–1998	3	1	12	20	2		43[a]
1998–1999	4	6	3	5	15	10	45[a]
1999–2000	2	9	30	32	12		85
2000–2001	1	2	11	4	6	1	31[a,b]
2001–2002	4	4	27	43	19		109[a]
Totals	23	40	96	137	73	11	434

[a]includes unknown month of harvest
[b]includes one wolf shot during the fall hunting season

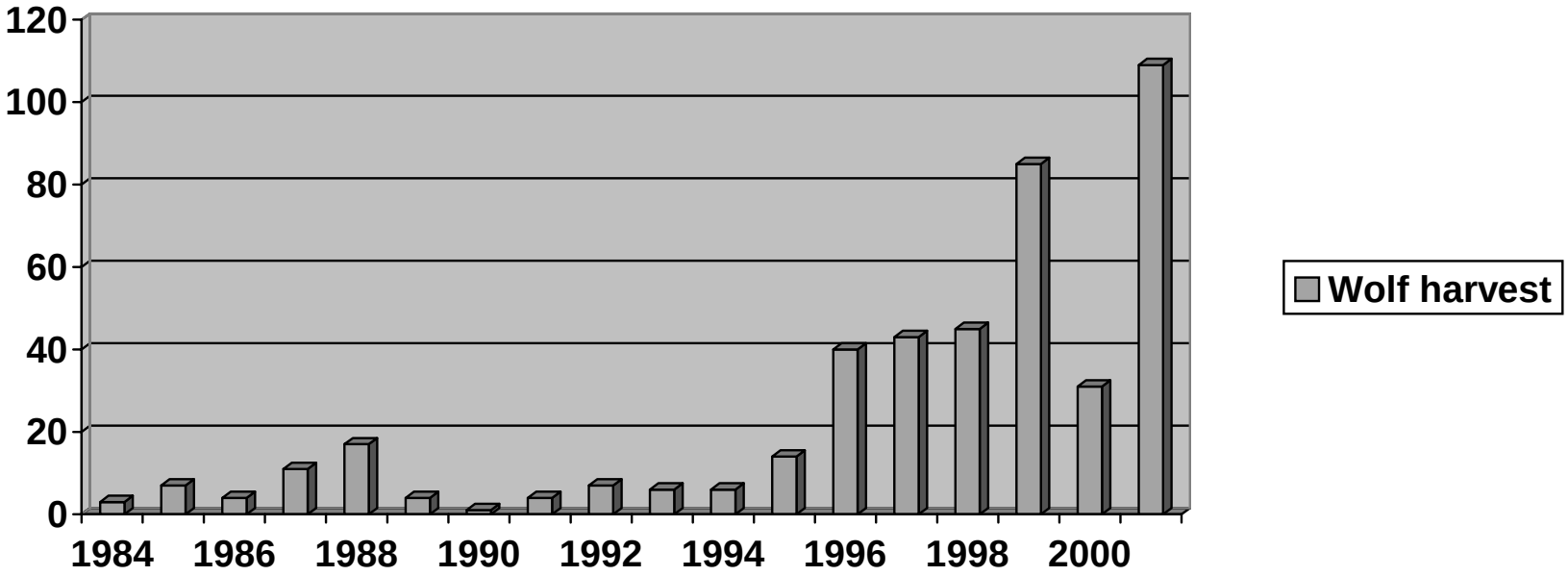

Figure 1 Reported wolf harvest 1984–2001

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNITS: 19A, B, C, and D and 21A and E (60,523 mi^2)

GEOGRAPHIC DESCRIPTION: Drainages of the Kuskokwim River upstream from the village of Lower Kalskag; Yukon River drainage from Paimiut upstream to, but not including, the Blackburn Creek drainage; the entire Innoko River drainage; and the Nowitna River drainage upstream from the confluence of the Little Mud and Nowitna Rivers.

BACKGROUND

Wolves play multiple roles in the economy and ecology of the upper Kuskokwim River region. Trappers seek wolf pelts for both personal use and commercial sale. Hunters consider wolves both trophy big game animals and competitors for moose.

Regulations that prescribe harvests of wolves in Units 19 and 21 have changed frequently in response to public controversies over wolf control programs in other regions of the state. Wolf harvest declined after cessation of bounties in 1967 and after the Federal Airborne Hunting Act of 1972 eliminated the common practice of shooting wolves from airplanes. However, the Alaska Department of Fish and Game (ADF&G) issued aerial shooting permits to members of the public until 1983 as part of specific management programs.

Few wolves were taken by aerial shooting in Unit 19, with the exception of regulatory year (RY) 1978 (RY78 = 1 Jul 1978 through 30 Jun 1979), when 29 were reported killed using this method. Only 4 wolves, other than those taken in RY78, were taken under the authority of aerial permits during RY72–RY83. Most harvest (67%) during that period occurred by land-and-shoot hunting, and the kill was 32–81 annually (Pegau 1984). Hunting of wolves by land-and-shoot continued until RY92 when all same-day-airborne hunting was prohibited. Beginning in RY94, same-day-airborne taking of wolves was permitted for holders of a trapping license if trappers moved more than 300 ft from the aircraft before shooting a wolf. A public ballot initiative in November 1996 repealed that “land and walk” regulation beginning in late February 1997, again prohibiting all same-day-airborne hunting of wolves.

Wolf predation can play a significant role in the population dynamics of moose (Gasaway et al. 1992), but the specific effects of wolf predation on moose populations within the

Kuskokwim drainage have not been thoroughly studied. However, Keech et al. (2002) recently gained significant insight into the degree and causes of mortality among moose calves. Black bears, wolves, and grizzly bears all were identified as significant predators. As early as 1980, biologists recognized moose densities were low in the upper Kuskokwim. At the time, the situation was characterized as a "predator problem," aggravated during 1989–1995 by 4 severe winters with deep, persistent snow. In the early 1990s, residents reported declining moose numbers; and in 1994, with the aid of the Tanana Chiefs Conference, local residents met with officials from the Alaska Department of Fish and Game to discuss predator control options. Local residents favored wolf control programs designed to reduce wolf numbers and increase moose for subsistence use. The Alaska Board of Game adopted a Wolf Control Implementation Plan for Unit 19D East (5200 mi^2 which includes Unit 19D upriver of, but not including, the Black and Selatna river drainages) in 1995 and reauthorized the same plan with updated population numbers in January 2000. To date, no plan has been implemented.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. The domestication of wolves for personal use or for commercial purposes is incompatible with department management policies.

Management may include various options ranging from manipulation of wolf population size by humans to total protection of wolves from human influence. Not all human uses will be allowed in all areas or at all times. Management will focus on providing sustained, diverse human uses of wolf populations consistent with goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Alaska Board of Game on 30 October 1991 and revised on 29 June 1993. Those goals are to:

- Ensure the long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.
- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.
- Increase public awareness and understanding of the uses, conservation, and management of wolves, their prey, and habitat in Alaska.

MANAGEMENT OBJECTIVES

- Provide for a sustained annual harvest rate of up to 30% from the combined wolf population of Units 19, 21A, and 21E, except where greater harvest rates are mandated by approved wolf predation control implementation plans.

MANAGEMENT ACTIVITIES

- Monitor wolf numbers and population parameters.
- Synthesize incidental sightings, hunter interviews, trapper questionnaires, and sealing document information to refine annual wolf population estimates in the management area.
- Continue to purchase wolf carcasses from local trappers to obtain morphometric and reproductive information.
- Model the potential effects of wolf predation on prey populations in all subunits.
- Develop a proposal to conduct research on low-density wolf–prey population dynamics in Unit 19D East.
- Monitor harvests through sealing records and trapper questionnaires.
- Conduct wolf predation control programs as directed by the ADF&G commissioner and the Alaska Board of Game.
- Encourage wolf harvest through education programs designed to increase trapper skills, ethics, and regulatory compliance.
- Conduct wolf trapping and snaring clinics in communities that have expressed interest in the program.
- Provide classroom presentations to schools on wolf biology and management.
- Maintain communication with other local agencies, Native corporations, and locals regarding wolf management, and cooperate with any ongoing wolf studies.
- Incorporate local knowledge, information, and assistance in management strategies for wolves.
- Encourage reporting of wolf harvests and observations on trapper questionnaires.

METHODS

We estimated wolf abundance within Unit 19D East during February 2001 using a reconnaissance track survey (Stephenson 1978). The same area was surveyed in 1995 and 1997 using a Sample Unit Probability Estimator (SUPE; Becker et al. 1998). During the 2001 survey, 4 experienced pilot–observer teams were deployed in fixed-wing aircraft to make direct observations of wolves and to count tracks in assigned blocks of land. Wolf

observations (packs, pairs, and singles), tracks, and kill sites were mapped, and team members discussed potential overlap among sightings to reduce the possibility of overestimating the number of packs or wolves in a pack. All independent observations were combined to determine a minimum number of wolves in the survey area. To validate the estimate, we obtained additional information about wolf pack sizes and territory boundaries from conversations with wolf hunters and trappers.

Estimates of areawide wolf population size were summarized by regulatory year for previous reporting periods through RY98. Autumn wolf population size in Units 19, 21A, and 21E was estimated again in 2002 using a combination of information from Unit 19D East surveys, Unit 20A wolf research data, harvest records, and hunter–trapper interviews and questionnaires.

Sealing by an ADF&G representative or an appointed fur sealer is required for wolves taken in Alaska, and we obtained harvest statistics primarily from these sealing documents. We assumed that >90% of the annual wolf harvest was reported on sealing certificates because most wolves harvested from western Interior Alaska are sold rather than used locally for garments. During the sealing process, information was collected on specific location and method of take, date, sex, color of pelt, estimated size of the wolf pack, and method of transportation. Harvest data were summarized by regulatory year. Where practical, harvest indicated on sealing documents was validated by Fur Acquisition Reports and Fur Export Reports.

During RY00–RY02 we purchased and examined over 75 wolf carcasses taken in Unit 19D East by trappers. We recorded location, date and method of take, pelt color, body measurements, injuries, and fat indices. Placental scars were quantified from excised female reproductive tracts. A premolar was extracted from each cleaned skull for cementum aging. In addition to payment by ADF&G for wolf carcasses, trappers received $100/wolf from the McGrath Village Council to compensate for fuel and equipment costs.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size and Density

We estimated 1200–1600 wolves occupied home ranges within the management area (Units 19, 21A, and 21E) during RY96–RY98 (Table 1a) and that 1330–1880 wolves ranged within the management area in autumn 2002 (Table 1b). Local trappers who responded to the 2001–2002 trapper questionnaire thought wolves were moderate to abundant during RY99–RY01, and populations were stable or increasing.

Three spring wolf population estimate surveys have been conducted in Unit 19D East since RY94 (Table 1c). During February 1995, 164 wolves (90% CI = 121–209) in 23 packs were estimated (SUPE) to use the area. The same area was surveyed during February 1997 (SUPE), and we estimated 56 wolves (90% CI = 43–73) in 14 packs. In February 2001 we estimated 102 wolves among 14 packs in Unit 19D East, roughly the midpoint of the 1995 and 1997 survey results. Large differences in wolf population estimates between 1995 and 1997 could reflect a wolf numerical response to increased moose vulnerability following severe winters

in the early 1990s (Whitman and McNay 1997). However, the Mulchatna caribou herd extended its range into the Kuskokwim drainage during 1996–1997 and likely provided an alternate prey source for wolves. In addition to windy conditions, the network of caribou tracks complicated wolf tracking during 1997 surveys south and east of McGrath. Consequently, several wolf packs observed in 1995 and 2001 were likely not quantified in 1997. Packs missed/not observed in those areas could have resulted in the significantly lower population estimate for that year.

Current estimates of wolf densities within Unit 19D East are consistent with predicted prey biomass and wolf density relationships observed in other parts of Alaska and North America (Fuller 1989).

Population Composition

The only data available relative to the sex composition of the wolf population were sex ratios from the harvested segment of the population reported on sealing documents. Ratios in the harvest were not significantly different from 1:1 (males:females) during RY85–RY01 ($P = 0.09$), and were assumed to represent overall population sex ratios.

Distribution and Movements

Harvest locations, observed wolf tracks, and incidental sightings indicated the wolf population was well distributed throughout the management area. Wolf habitat is defined less by physical habitat requirements than by abundance of prey, and potential ungulate prey existed throughout the management area during the reporting period.

MORTALITY

Harvest

Season and Bag Limit.

Unit/Bag Limit/Special Restrictions	Resident/Nonresident Open Seasons
RY99	
Units 19, 21A, and 21E.	
HUNTING: 5 wolves.	10 Aug–30 Apr
TRAPPING: No limit.	1 Nov–30 Apr
RY00	
Units 19A, 19B, 19C, 21A, and 21E.	
HUNTING: 5 wolves.	10 Aug–30 Apr
TRAPPING: No limit.	1 Nov–30 Apr

Unit/Bag Limit/Special Restrictions	Resident/Nonresident Open Seasons
Unit 19D.	10 Aug–30 Apr
HUNTING: 10 wolves per day.	1 Oct–30 Apr
TRAPPING: No limit.	
RY01	
Units 19A, 19B, and 19C.	
HUNTING: 5 wolves.	10 Aug–30 Apr
TRAPPING: No limit.	1 Nov–30 Apr
Unit 19D.	
HUNTING: 10 wolves per day.	10 Aug–30 Apr
TRAPPING: No limit.	1 Oct–30 Apr
Units 21A and 21E.	
HUNTING: 5 wolves.	10 Aug–30 Apr
TRAPPING: No limit.	1 Nov–30 Apr

Alaska Board of Game Actions, Emergency Orders, and Legislative Actions. The Alaska Board of Game reauthorized an updated version of the Wolf Control Implementation Plan in January 2000. Updates to the plan included revisions to the population estimates and corresponding population goals and objectives. No plan has been implemented to date. In January 2000 the board also authorized the use of snowmobiles to pursue wolves in areas with current Wolf Control Implementation Areas, including Unit 19D East. In March 2000 the board increased the wolf hunting bag limit in Unit 19D from 5 per season to 10 wolves per day with no season limit. The start of the trapping season was also changed from 1 November to 1 October, with the "snare only of 3/32" or larger" stipulation already in regulation for the April and October portion of wolf trapping season. In May 2001 the board established a requirement that wolves harvested in Unit 19D be reported to McGrath ADF&G within 10 days of kill and, in March 2002, made it legal in Unit 19 to use snowmachines to take wolves, provided the snowmachine is stopped before shooting.

Hunter–Trapper Harvest. During RY99–RY01, 148, 181, and 208 wolves (respectively) were reported harvested in the management area (Table 2a); the average reported harvest was 179 wolves (s = 30.1, 90% CI = 150–208). Reported harvest in Unit 19D East during the same time period was 34, 36, and 23, respectively (Table 1c). Harvest data and population estimates both are based, in part, on anecdotal information and the assumption that no significant changes have occurred since we conducted more rigorous surveys. If we have met this assumption and our harvest reporting error is low, wolves in Unit 19D East presently are harvested at around 26%. Given current population size estimates and rates of harvest, the Unit 19D East wolf population is likely not limited by harvest and existing harvest levels appear to be sustainable. During the reporting period, wolves were harvested by ground shooting ($\bar{x}$ = 75/year, Tables 2b and 2c), trapping ($\bar{x}$ = 50/year), and snaring ($\bar{x}$ = 48/year).

For all subunits, ground shooting was the most common method to harvest wolves (42%), but the importance of trapping versus snaring differed among areas.

Hunter Residency and Success. Local trappers and hunters contributed to most of the annual wolf harvest in all subunits (51%; Table 2a). However, during the last 2 reporting periods, nonresidents were more successful than residents in harvesting wolves during the fall, incidental to hunting other big game species.

Success rates by wolf hunters/trappers are difficult to determine. One indicator may be the mean number of wolves taken per successful hunter/trapper (Table 2a). This number varies annually and shows no clear trend.

Harvest Chronology. Most reported wolf harvest occurred during February and March ($\bar{x}$ = 35 and 36, respectively; Table 3). February wolf harvests have remained stable for the last 5 reporting periods, but March harvests have declined by 18% per reporting period during that same time. In the past, trappers took advantage of increased day length and deeper snow to effectively harvest wolves in March. Greater snow depths allowed trappers to track wolf packs, to travel overland by snowmachine, and land aircraft to facilitate greater harvests of wolves during that month. However, restrictions placed on aircraft during the mid-1990s appear to have caused declines in March harvests.

September and December wolf harvests have increased during the previous 5 reporting periods. Fall moose and caribou hunters incidentally harvested greater numbers of wolves than previously observed. During the RY93–RY95 reporting period, hunters harvested an average of 7 wolves during September, but took an average of 24 wolves during the same month in RY99–RY01 (Table 3). Of the 134 wolves harvested in September since 1995, nonresidents took 91 (68%) while residents took 43 wolves (32%). Several factors likely contributed to this increase including reduction or elimination of nonresident tag fees, heightened interest in wolf harvest by guided hunters, and perceptions by hunters of the effects of wolf predation on ungulate populations. These chronologic changes in wolf harvest were evident in sealing data gathered during the reporting period, and confirm Whitman's (1997) prediction that with aircraft restrictions in place, harvests will become more equally distributed throughout the winter.

Transport Methods. The method of transportation used by hunters and trappers to harvest wolves has steadily shifted from primarily aircraft during RY87–RY91 to snowmachines during RY96–RY01 (Table 4). In past years, hunters/trappers who used airplanes for access typically traveled from the south side of the Alaska Range to take wolves in Units 19 and 21, but aircraft-use restriction limited this mode of access. If harvest of wolves by nonresidents continues to increase, use of aircraft as a transport method may also increase again. Other methods of transport, such as dog team and snowshoes, were less important.

Other Mortality

During winter 1999–2000, a trapper in Unit 19D observed a wolf crippled by what appeared to be a blow to the spine. The wolf was paralyzed from the hips back and, after skinning, a large contusion was noted just anterior of the pelvis. Injuries sustained during predatory

attempts on moose are one source of natural mortality. Intraspecific aggression also contributes to natural mortality, however we did not observe specific cases of natural mortality during the reporting period.

POSTMORTEM EXAMINATIONS

Unit 19D East wolf necropsy data (RY00–RY02) are summarized in Table 5 and will be analyzed at a future date.

NONREGULATORY MANAGEMENT PROBLEMS, NEEDS, AND EDUCATION

Collecting survey and inventory information on wolf populations is a major challenge faced by wildlife managers. Population size estimates are the most difficult to derive, because they require adequate search conditions, an experienced pilot–observer team, and sufficient funding. While it will continue to be important to gather data on wolf populations in Unit 19D East, data gaps exist in the rest of the management area. Potential moose planning efforts in those areas need relatively good information to proceed, and we have not surveyed wolf populations in those subunits.

To encourage ethical trapping, promote best management practices, and reduce nontarget catch, we offered free-of-charge wolf trapping and snaring clinics in Sleetmute, Aniak, and Anvik in January 2000, and in McGrath in February 2002. Participants each made a dozen snares equipped with modified locks designed to release adult moose and were taught snare-setting techniques to maximize wolf harvest while minimizing incidental moose take. At the request of the Grayling city council, we also will conduct a clinic in that community in winter 2003.

CONCLUSIONS AND RECOMMENDATIONS

Hunting and trapping of wolves in Units 19, 21A, and 21E has not regulated the wolf population since restrictions were placed on the use of aircraft in the early 1990s. As more local people realize that predator-control actions by the department are constrained politically, interest in clinics and trapping incentive programs may increase. Public involvement and enthusiasm may be determined by how much the tribal and/or city councils are willing to contribute to incentive programs that compensate successful trappers for their time, fuel, and equipment. Community dynamics vary across the management area, and some villages may be more likely to increase wolf harvests than others. For example, Grayling residents typically ground-shoot wolves along the river; many are not familiar with wolf trapping–snaring techniques nor can they typically afford trapping hardware. Encouraging different methods of take may generate more interest in wolf trapping in Unit 21E.

While some trapper incentive programs will undoubtedly increase harvest in small areas, they will not effectively reduce overall wolf numbers. Likewise, recent regulatory changes by the Board of Game will likely have little effect on the overall harvest of wolves. Due to the topography in Unit 19D, using snowmachines to pursue wolves is not likely to be an effective means of increasing harvest.

Our objective for the next reporting period will be to continue to provide for a sustained annual harvest rate of up to 30% from the combined wolf population of Units 19, 21A, and 21E, except where greater harvest rates are mandated by approved wolf predation control implementation plans. In addition to this management objective, the Board of Game has approved objectives as part of the Unit 19D East wolf predation control implementation plan to reverse the decline in the Unit 19D East moose population by reducing the wolf population (to no fewer than 20 wolves) in an efficient, safe, and humane manner.

Management activities for the next reporting period are:

- Conduct an aerial survey of the wolf population in Unit 19D East in late winter 2004.
- Continue to refine annual wolf population estimates in the area, based on incidental sightings, hunter interviews, trapper questionnaires, and evaluation of sealing documents.
- Monitor harvests through sealing records and trapper questionnaires.
- Conduct wolf predation control programs as directed by the commissioner and Board of Game.
- Conduct wolf trapping and snaring clinics in communities that have expressed interest in the program.
- Cooperate with any other agencies conducting wolf studies within the management area, and incorporate local knowledge and assistance in management strategies for wolves.

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TABLE 1a Units 19, 21A, and 21E autumn wolf population estimates[a], regulatory years 1985–1986 through 2002–2003

Regulatory year	Population estimate	Number of packs	$\bar{x}$ Wolves/Pack
1985–1986	660–780	110–129	6.0
1986–1987	670–780	107–136	6.0
1987–1988	665–770	76–95	8.4
1988–1989	710–815	72–88	9.5
1989–1990	720–940	72–91	10.2
1990–1991	720–940	72–91	10.2
1991–1992	720–940	72–91	10.2
1992–1993	750–950	71–92	10.4
1993–1994	970–1000	72–90	12.2
1994–1995	1568–1768	170–200	9.0
1995–1996	1200–1768	170–200	8.0
1996–1997	1200–1300	150–170	7.8
1997–1998	1300–1500	160–180	8.2
1998–1999	1400–1600	170–190	8.3
1999–2000 thru 2001–2002[b]			
2002–2003	1330–1800	189–258	7.0

[a] Fall estimate = pretrapping season population based on population surveys, incidental observations, reports from public, sealing records, and trapper questionnaires.
[b] Data not available for these years.

TABLE 1b Units 19, 21A, and 21E wolf population estimates, autumn 2002

	Autumn population estimate		Number	
Subunit	Min	Max	of packs	Trend
19A	220	300	31–43	stable to increasing
19B	170	230	24–33	increasing
19C	150	205	21–29	increasing
19D	270	365	39–52	stable
21A	340	460	49–66	stable
21E	180	240	25–35	stable
Total	1330	1800	189–258	

TABLE 1C Unit 19D East (5200 mi^2) wolf population estimates and harvest

Year	Population estimate	90% CI	Range	No. packs	$\bar{x}$ Wolves/ pack	Estimated density Wolves/ 1000 mi^2	Estimated density Wolves/ 1000 km^2	Moose/Wolf ratio	Total harvest	Harvest rate
1994–1995	164[a]	27.7%	121–209	23	7	31.4	12.1	12	25	13%
1996–1997	56[a]	30.8%	43–73	14	4	10.8	4.2	23–25	39	41%
2000–2001	102[b]	NA	NA	14	6	19.6	7.6	22	36	26%

[a] Sample Unit Probability Estimator (SUPE).
[b] Reconnaissance track survey.

TABLE 2a Units 19, 21A, and 21E wolf harvest, regulatory years 1985–1986 through 2001–2002

Regulatory	Reported harvest				Residency			$\bar{x}$ Wolves/	Harvest
year	M	F	Unknown	Total	Nonresident	Resident	Unknown	Trapper	rate (%)
1985–1986	25	30	0	55	0	2	53	2.1	8
1986–1987	70	49	14	133	0	2	131	3.3	18
1987–1988	114	97	9	220	0	0	220	3.8	31
1988–1989	89	68	21	178	0	0	178	3.6	23
1989–1990	105	86	12	203	0	0	203	3.4	24
1990–1991	102	87	6	195	0	0	195	3.1	23
1991–1992	57	62	15	134	0	0	134	2.4	16
1992–1993	22	13	15	50	3	28	19	1.9	6
1993–1994	48	45	5	98	4	91	3	2.6	10
1994–1995	124	92	34	250	12	225	13	3.0	15
1995–1996	78	46	1	125	7	118	0	3.8	8
1996–1997	89	94	5	188	11	177	0	2.7	15
1997–1998	54	42	8	104	15	89	0	1.9	7
1998–1999	97	64	12	173	30	143	0	2.1	11
1999–2000	85	60	3	148	23	125	0	2.3	–[a]
2000–2001	95	72	14	181	27	154	0	2.3	–[a]
2001–2002	112	87	9	208	25	183	0	2.8	–[a]
Total	1366	1094	183	2643	157	1337	1149		
% of Total	52	41	7	100	6	51	43		

[a] Harvest rate not calculated because population estimate was not obtained.

TABLE 2b Units 19A, 19B, 19C, and 19D wolf harvest and harvest method, regulatory years 1985–1986 through 2001–2002

Regulatory	Unit 19A					Unit 19B					Unit 19C					Unit 19D				
year	Shoot	Trap	Snare	O/U[a]	Total	Shoot	Trap	Snare	O/U[a]	Total	Shoot	Trap	Snare	O/U[a]	Total	Shoot	Trap	Snare	O/U[a]	Total
1985–1986	1	0	1	0	2	0	1	0	0	1	4	1	1	0	6	20	7	4	0	31
1986–1987	0	4	4	0	8	15	1	0	0	16	12	6	4	0	22	13	11	1	4	29
1987–1988	52	1	1	1	55	55	1	0	0	56	9	3	1	0	13	11	2	1	1	15
1988–1989	3	2	0	1	6	31	1	0	0	32	37	2	1	0	40	29	2	1	0	32
1989–1990	21	1	1	3	26	43	2	0	1	46	41	0	0	0	41	15	2	3	1	21
1990–1991	40	1	0	0	41	10	1	0	0	11	40	1	3	0	44	30	2	0	0	32
1991–1992	19	0	1	0	20	21	1	0	0	22	47	1	1	0	49	13	3	4	0	20
1992–1993	11	3	0	0	14	2	2	0	1	5	6	1	4	0	11	0	3	0	0	3
1993–1994	0	0	6	0	6	14	2	0	3	19	21	4	11	1	37	8	4	10	0	22
1994–1995	40	1	4	0	45	25	17	0	0	42	36	4	21	0	61	9	5	21	3	38
1995–1996	15	0	6	2	23	22	3	2	0	27	14	0	5	0	19	9	6	3	0	18
1996–1997	11	1	1	0	13	10	3	6	0	19	19	3	11	0	33	6	12	21	3	42
1997–1998	4	5	5	0	14	10	3	1	0	14	7	0	0	0	7	3	10	17	0	30
1998–1999	28	12	1	2	43	14	23	2	0	39	6	2	6	0	14	8	5	7	0	20
1999–2000	18	1	2	0	21	13	15	0	0	28	13	4	7	0	24	17	2	20	0	39
2000–2001	8	8	7	2	25	20	12	6	0	38	7	4	5	0	16	12	9	15	1	37
2001–2002	14	22	6	4	46	22	19	13	1	55	8	8	12	0	28	5	6	13	5	29
Total	285	62	46	15	408	327	107	30	6	470	327	44	93	1	465	208	91	141	18	458
% of Total	70	15	11	4	100	70	23	6	1	100	70	9	20	<1	100	45	20	31	4	100
5-year $\bar{X}$					30					35					18					31

[a] O/U = Other/Unknown.

TABLE 2c Units 21A and 21E wolf harvest and harvest method, regulatory years 1985–1986 through 2001–2002

Regulatory year	Unit 21A					Unit 21E				
	Shoot	Trap	Snare	O/U[a]	Total	Shoot	Trap	Snare	O/U[a]	Total
1985–1986	3	6	0	0	9	3	2	0	1	6
1986–1987	18	15	6	1	40	7	4	0	7	18
1987–1988	31	3	11	0	45	28	4	1	0	33
1988–1989	43	1	0	0	44	22	2	0	0	24
1989–1990	38	5	21	0	64	3	2	0	0	5
1990–1991	38	1	3	0	42	25	0	0	0	25
1991–1992	1	2	4	0	7	7	8	0	0	15
1992–1993	0	7	2	0	9	3	2	0	1	6
1993–1994	3	0	4	0	7	5	1	0	1	7
1994–1995	4	0	5	0	9	28	21	0	6	55
1995–1996	0	2	2	0	4	20	0	14	0	34
1996–1997	9	4	26	0	39	8	8	8	10	34
1997–1998	3	11	10	0	24	7	2	1	2	12
1998–1999	4	3	16	0	23	15	9	8	0	32
1999–2000	5	6	10	0	21	4	11	0	0	15
2000–2001	7	1	19	0	27	29	1	5	0	35
2001–2002	4	1	3	4	12	17	14	1	0	32
Total	211	68	142	5	426	231	91	38	28	388
% of Total	50	16	33	1	100	60	23	10	7	100
5-year $\bar{x}$					21					25

[a] O/U = Other/Unknown.

TABLE 3 Units 19, 21A, and 21E wolf harvest chronology by month, regulatory years 1985–1986 through 2001–2002

Regulatory year	Harvest chronology by month										Total harvest
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	
1985–1986	0	2	0	2	11	16	19	5	0	0	55
1986–1987	0	0	0	13	11	13	51	40	1	4	133
1987–1988	1	5	0	5	9	37	53	87	18	5	220
1988–1989	2	3	1	4	7	15	14	118	2	12	178
1989–1990	1	8	0	7	21	30	25	108	3	0	203
1990–1991	0	5	1	0	9	21	43	116	0	0	195
1991–1992	0	2	0	1	19	19	35	57	1	0	134
1992–1993	1	5	0	4	1	3	12	21	3	0	50
1993–1994	2	7	0	4	10	21	13	35	3	3	98
1994–1995	4	12	2	4	31	50	64	67	16	0	250
1995–1996	0	1	1	6	2	17	33	56	9	0	125
1996–1997	1	16	0	19	31	32	34	51	1	3	188
1997–1998	5	21	0	8	15	7	25	21	2	0	104
1998–1999	3	24	3	6	15	28	35	56	3	0	173
1999–2000	5	24	0	10	18	9	41	35	6	0	148
2000–2001	4	32	2	23	19	33	30	36	2	0	181
2001–2002	6	16	8	20	35	22	35	38	14	14	208
Total	35	183	18	136	264	373	562	947	84	41	2643
% of Total	1	7	1	5	10	14	21	36	3	2	100

TABLE 4 Units 19, 21A, and 21E harvest by transport method, regulatory years 1985–1986 through 2001–2002

Regulatory year	Harvest by transport method				
	Aircraft	Snowmobile	Dog team/snowshoe	Other[a]	Total
1985–1986	13	8	12	22	55
1986–1987	88	23	7	15	133
1987–1988	179	30	8	3	220
1988–1989	139	14	5	20	178
1989–1990	161	35	1	6	203
1990–1991	162	24	4	5	195
1991–1992	109	2	14	9	134
1992–1993	9	29	5	7	50
1993–1994	49	36	5	8	98
1994–1995	64	121	53	12	250
1995–1996	85	29	8	3	125
1996–1997	40	102	31	15	188
1997–1998	28	48	16	12	104
1998–1999	42	113	5	13	173
1999–2000	34	88	20	6	148
2000–2001	39	108	18	16	181
2001–2002	44	97	33	34	208

[a] "Other" includes: boats, 3- and 4-wheelers, off-road vehicles, and highway vehicles.

TABLE 5 Unit 19D wolf necropsy data, regulatory years 2000–2001 through 2002–2003

Regulatory year	*N*	Males	Avg skinned weight (lb)	Females	Avg skinned weight (lb)	Age			Xiphoid fat (g)	Total fat[a] (mm)	Reproductive females	Total scars
						Pups	Yrlg	2+ yr				
2000–2001	23	14	70	9	65	6	6	11	137	27	2	9
2001–2002	25	16	65	9	49	–[b]	–[b]	–[b]	94	22	–[c]	–[c]
2002–2003	29	15	70	14	61	–[b]	–[b]	–[b]	117	28	5	19

[a] Sum of rump, sternum, and flank fat measurements.
[b] Data not yet available.
[c] Reproductive tracts were not analyzed.

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNITS: 20A, 20B, 20C, 20F, and 25C (39,228 mi^2)

GEOGRAPHIC DESCRIPTION: Lower Tanana Valley, Central Yukon Valley

BACKGROUND

Wolf population size and harvest have varied considerably, both spatially and temporally, within this management area. Wolf numbers are primarily regulated by prey availability; but wolf control and harvest have periodically reduced wolf populations in portions of the management area. The annual wolf harvest is influenced by wolf numbers and hunter–trapper access.

Human consumptive use of caribou, moose, and sheep has been a dominant interest among Fairbanks residents. To enhance the harvestable surplus of ungulates, the Alaska Department of Fish and Game (ADF&G) conducted wolf predation control programs in Units 20A (autumn 1975–spring 1982 and Oct 1993–Nov 1994) and 20B (autumn 1979–spring 1986). The most recent program in 1993–94 was implemented to reverse a caribou population decline associated with a density dependent response to unfavorable weather.

Because of the interest in consumptive use, ADF&G staff continue intensive investigations on predator–prey relationships, especially in Unit 20A (Gasaway et al. 1983; Boertje et al. 1996). Within Denali National Park and Preserve in adjacent Unit 20C, a 16-year wolf study continues because of interest in the animal as predator, wilderness symbol, and fundamental component of a naturally regulated system (Adams et al. 1995; Mech et al. 1995; Meier et al. 1995). In addition, trappers continue the long tradition of harvesting this economically and culturally significant furbearer.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

ADF&G will manage wolf populations to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography,

viewing, listening, and scientific and educational purposes. We recognize the aesthetic value of observing wolves in their natural environment as an important human use of wolves.

We also recognize that integral to wolf management is the premise that wolf populations are renewable resources that can be harvested and manipulated to enhance human uses of other resources. Management may include both the manipulation of wolf population size and total protection of wolves from human influence.

MANAGEMENT OBJECTIVES

Objectives during this reporting period were to:

1 Monitor harvest through sealing certificates.

2 Conduct aerial surveys in Units 20B, 20C, 20F, and 25C.

3 Monitor the wolf population in Unit 20A by maintaining radio collars in wolf packs, including packs inhabiting the flats.

4 Assist wolf research efforts in Unit 20A.

METHODS

POPULATION SIZE

To obtain population estimates for Unit 20A in regulatory years (RY) 1999 and 2000 (RY = 1 Jul through 30 Jun; e.g., RY00 = 1 Jul 2000 through 30 Jun 2001), we estimated wolf numbers from radiocollared packs in the foothills/mountains and extrapolated to the Tanana Flats. Work in the foothills/mountains was conducted as part of ongoing wolf research in the unit (McNay 1999). Snow conditions during spring 2000 were not adequate to conduct aerial wolf population surveys on the Tanana Flats. In spring 2001 a reconnaissance survey to assess snow conditions in the flats was conducted, but conditions were deemed too poor to conduct a reliable survey. In RY01 we estimated wolf numbers by extrapolating from the RY00 foothills/mountains estimate using radiocollared packs (research in the foothills/mountains ended in spring 2001) and adding the estimated number derived from a spring 2002 population survey conducted on the Tanana Flats.

We collected miscellaneous observations and reports for all areas. We also collected additional information for Unit 20B while conducting lynx–hare surveys (RY99 and RY00), moose surveys, and other reconnaissance flights. However, extrapolations from earlier or adjacent surveys provided the primary basis for estimates in areas other than Unit 20A. We used data from radiotelemetry surveys in Denali National Park to estimate wolf numbers in Unit 20C.

HARVEST

We used wolf sealing certificate data to determine annual harvests. During the sealing process, information was collected on specific location and method of take, date, sex, color of pelt,

estimated size of the wolf pack, and transportation. Harvest data were summarized by regulatory year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

For all subunits, we estimated 600–850 wolves in 85–130 packs in fall 1999, 650–850 wolves in 85–130 packs in 2000, and 650–900 wolves in 85–130 packs in 2001. While total wolf numbers vary slightly, they only reflect new information for Units 20A and 20C (Table 1). The ranges represent the combined subjective minimum and maximum estimates for each subunit.

The wolf population trend in Unit 20A has differed substantially from that in Unit 20C since the mid-1990s. Wolf numbers in Unit 20A increased after wolf control was suspended in 1994 and approached precontrol levels by 1998 (Table 1). Wolf numbers declined sharply in 1999, most likely due to the synergistic effects of high harvest and large take of alpha animals (ME McNay, ADF&G, personal communication), and then increased between 1999 and 2001. It appears that as a result of high harvests, wolf densities in 20A are now below theoretical densities that could be supported by current moose densities. By contrast, researchers in Denali National Park and Preserve documented a sharp decline in the wolf population in southern Unit 20C during 1992–1995. The wolf population then fluctuated around that lower level during 1995–2001, likely due to the continued decline of the Denali caribou herd and relatively low snowfall during most years (LA Adams, USGS–Biological Resources Division, personal communication). Lower estimates reflect those observations.

MORTALITY

Harvest

Season and Bag Limit. Smith (1994) summarized the history of regulations pertaining to same-day-airborne and land-and-shoot taking of wolves in Alaska. The hunting and trapping regulations for Units 20 and 25C during this reporting period were:

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
Units 20A, 20B, 20C, 20F, and 25C		
RY99		
HUNTING: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit. A wolf may be shot same day airborne if caught in a trap or snare.	1 Nov–30 Apr	1 Nov–30 Apr

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
RY00		
HUNTING: 5 wolves. No wolf hunting same day airborne. In areas designated for active wolf management a wolf may be shot same day airborne or from a moving snowmachine.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit. A wolf may be shot same day airborne if caught in a trap or snare.	1 Nov–30 Apr	1 Nov–30 Apr
RY01		
HUNTING: 5 wolves. No wolf hunting same day airborne. In areas designated for active wolf management a wolf may be shot from a moving snowmachine.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit. A wolf may be shot same day airborne if caught in a trap or snare.	1 Nov–30 Apr	1 Nov–30 Apr

Alaska Board of Game Actions and Emergency Orders. In June 1993 the Alaska Board of Game authorized same-day-airborne shooting of wolves, provided the person attempting to take a wolf had a trapping license and was at least 300 ft from the airplane. In November 1996 this method of take was prohibited through a statewide ballot referendum (effective 25 Feb 1997).

November 2000 – A small area of approximately 19 mi^2 in Unit 20C near Denali was closed to the taking of wolves. The area was closed to all wolf hunting and trapping, beginning at the point of intersection of the boundary of Denali National Park and the Savage River, along a straight line northwest to a point on the park boundary 2 miles south of the Stampede Trail, then south and east along the park boundary to the point of beginning. This regulation became law on 3 January 2001.

May 2001 – Expanded the 19-mi^2 area in Unit 20C closed to the taking of wolves to approximately 72 mi^2 (Stampede Closed Area: Unit 20C, all lands west of the Savage River bounded by Denali National Park). Also made it unlawful in that portion of Unit 20C described above (5 AAC 92.550[7]), to take furbearers by using a snare with a cable diameter of 3/32 inch or larger that is set out of water.

October 2002 – Established the Nenana Canyon Closed Area: Units 20A and 20C, those portions bounded by a line beginning at the confluence of Healy Creek and the Nenana River, east along the south bank of Healy Creek to the eastern edge of the Southern Anchorage-to-Fairbanks intertie right-of-way, then south along the eastern edge of the intertie right-of-way to the southern boundary of Unit 20A, then west along the boundary of Unit 20A and then across the Nenana River to the west bank of the Nenana River, then north along the west bank of the Nenana River to the Moody Bridge at MP 242.9 of the George Parks Highway, then across the Moody Bridge to the Unit 20A boundary, then north along the boundary of Unit 20A to the point of beginning; closed to the taking of wolves. Also made it unlawful in those portions of Units 20A and 20C described above (5 AAC 92.550[8]), to take furbearers by using a snare with a cable diameter of 3/32 inch or larger that is set out of water.

Hunter–Trapper Harvest. Areawide wolf harvest, in general, increased between RY96–RY98 (annual mean = 186 wolves) and RY99–RY01 (annual mean = 225 wolves; Table 2). This was the case for all subunits, but not all years.

Wolf harvest varied considerably across years. Excluding years in which wolf control was conducted (i.e., 1993 and 1994), areawide wolf harvest increased in RY96 to its highest level (209 wolves) since RY85, fell in RY97 to its lowest level (146 wolves) since RY89, and then increased again to record highs in RY00 and RY01 (244 and 249 wolves, respectively). This general pattern was apparent in all subunits. These oscillations were not likely related to fluctuations in wolf numbers, but rather to other unidentified factors (e.g., weather, snow conditions, trapping pressure). For instance, in Unit 20A the percentage of the estimated fall wolf population harvested by hunters and trappers fell from 33% in RY95 and RY96 to 20% in RY97 (M.E. McNay, ADF&G, unpublished data), despite an apparent increase in the wolf population (Tables 1 and 2).

Areawide, the number of trappers increased at an average rate of about 13% annually between RY97 and RY00, but then declined by 13% between RY00 and RY01 (Table 2). There was no apparent trend in the number of wolves taken per successful trapper during the last 5-year period.

Harvest Chronology. Areawide, most wolves were harvested during the periods Nov–Dec and Jan–Feb (Table 3). Most of the remainder of the harvest was evenly distributed between the Sep–Oct and Mar periods. The August and April periods accounted for only a small portion of the harvest. Although these trends were apparent in all subunits, the more remote subunits (i.e., Units 20C, 20F and 25C) exhibited greater annual variability probably because of smaller sample sizes.

Method of Take and Transport Methods. Areawide, snaring continued as the leading method of take, followed closely by trapping (Table 2). The snowmachine has been by far the most popular type of transportation (Table 4). Generally, these trends were apparent for all subunits.

CONCLUSIONS AND RECOMMENDATIONS

Management objectives during this reporting period were not quantitative, and therefore can only be subjectively evaluated. We made progress on all of them, except conducting aerial surveys in Units 20B, 20C, 20F, and 25C. We monitored harvest, conducted aerial surveys in Unit 20A, monitored the Unit 20A population using radiotelemetry (i.e., packs in the foothills/mountains, but not packs inhabiting the Tanana Flats), and assisted wolf research efforts in Unit 20A. Regarding aerial surveys in Unit 20A, poor snow conditions and low funding levels compromised our ability to meet that objective.

During the next reporting period, Objectives 3 and 4 will be eliminated for 2 primary reasons: 1) The department will not be conducting field research on wolves in Unit 20A and, therefore, has no plans to maintain a sample of radiocollared animals; and 2) Maintaining radio collars in wolf packs on the Tanana Flats is cost prohibitive because of high attrition rates resulting from high harvest, natural mortality, and dispersal. Consequently, Objective 2 will be changed to an activity and expanded to include aerial surveys in Unit 20A. Therefore, for the next reporting period the quantifiable objective is to manage for fall density ≥ 11 wolves/1000 mi^2. Management activities will be to 1) monitor harvest through sealing certificates (Objective 1 from this reporting period), and 2) conduct aerial surveys in Units 20A, 20B, 20C, 20F, and 25C (Objective 2 from this reporting period).

Wolf research in Unit 20A should be recognized as important to intensive management statewide. We do not know whether the wolf population will reach the theoretical density that the number of prey can support. If the wolf population does reach its potential, the current success in moose management may be short-lived. To date, we have not taken advantage of increased moose yields by harvesting more cows and calves during periods of population growth through the 1980s and 1990s because the public desires higher moose densities, or fears that predation and antlerless (cow and calf) harvests will cause a moose population decline. Those concerns are understandable given the history of the effects of predation and cow harvests in Unit 20A during the 1970s (Gasaway et al. 1983). To gain public support for more aggressive harvest of enhanced moose populations, we need a clear strategy for management of enhanced predator–prey systems. Forming a viable management strategy hinges on a thorough understanding of wolf predation, weather, and competition for food among moose.

If the wolf population does not reach its potential, we can continue to recommend increased ungulate harvests, particularly of cows and calves. However, in that scenario we still must determine what factors regulate the wolf population in order to maintain that regulation. In RY99 and RY00, hunters and trappers harvested an estimated 44–50% of the autumn wolf population in Unit 20A. High harvest levels could potentially regulate the wolf population at a level that allows high moose harvests. Alternatively, social or complex food-related factors may result in regulation of the wolf population. The theoretical wolf densities expected from the current prey biomass have not been observed in the Interior. Further, wolf harvest intensity may influence the operation of such density-dependent factors. Similar questions apply to wolf–caribou relationships (Dale 1997).

At this juncture, I recommend maintaining Unit 20A seasons and bag limits to evaluate harvest trends under current regulations and trapping effort. Similarly, there seems little need to recommend changes for other units. However, regarding the April trapping–hunting season, concerns over fur quality and the pregnancy status of adult females will probably continue to generate proposals. Because trappers take so few wolves in April, little biological rationale exists for or against April seasons.

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TABLE 1 Units 20A, 20B, 20C, 20F, and 25C fall wolf population estimates, 1992–2001

Unit	Year	Population estimate[a]	Number of packs	Basis of estimate
20A	1992	220–295	25–35	Extrapolation from previous year
	1993	254[b]	20–25	Radiotelemetry and aerial surveys (mountains), extrapolation (Tanana Flats)
	1994	175[b]	20–25	Radiotelemetry and aerial surveys (mountains), extrapolation (Tanana Flats)
	1995	180[b]	20–25	Radiotelemetry and aerial surveys (mountains), extrapolation (Tanana Flats)
	1996	188[b]	20–25	Radiotelemetry and aerial surveys (mountains), extrapolation (Tanana Flats)
	1997	206[b]	20–25	Radiotelemetry and aerial surveys (mountains), extrapolation (Tanana Flats)
	1998	244[b]	20–25	Radiotelemetry and aerial surveys (mountains), extrapolation (Tanana Flats)
	1999	152[b]	20–25	Radiotelemetry and aerial surveys (mountains), extrapolation (Tanana Flats)
	2000	191[b]	20–25	Radiotelemetry and aerial surveys (mountains), extrapolation (Tanana Flats)
	2001	206–215	20–25	2000 density estimate (mountains)[c]; aerial survey, harvest reports (Tanana Flats)[d]
20B	1992	150–225	20–30	Extrapolation from 1989 and Unit 20B West (1990)
	1993	150–225	20–30	Extrapolation from previous year
	1994	150–225	20–30	Extrapolation from previous year
	1995	150–225	20–30	Extrapolation from previous year
	1996	150–225	20–30	Extrapolation from previous year
	1997	150–225	20–30	Extrapolation from previous year
	1998	150–225	20–30	Extrapolation from previous year
	1999	150–225	20–30	Extrapolation from previous year
	2000	150–225	20–30	Extrapolation from previous year
	2001	150–225	20–30	Extrapolation from previous year
20C	1992	200–320	25–40	National Park Service study and extrapolation
	1993	200–320	25–40	Denali National Park data and extrapolation from previous year
	1994	150–200	25–40	Denali National Park data and extrapolation from previous year
	1995	150–200	25–35	Denali National Park data and extrapolation from previous year
	1996	150–200	25–35	Denali National Park data and extrapolation from previous year
	1997	150–200	25–35	Denali National Park data and extrapolation from previous year
	1998	150–200	25–35	Denali National Park data and extrapolation from previous year
	1999	150–200	25–35	Denali National Park data and extrapolation from previous year

Unit	Year	Population estimate[a]	Number of packs	Basis of estimate
	2000	150–200	25–35	Denali National Park data and extrapolation from previous year
	2001	150–200	25–35	Denali National Park data and extrapolation from previous year
20F	1992	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
	1993	75–125	10–20	Extrapolation from previous year
	1994	75–125	10–20	Extrapolation from previous year
	1995	75–125	10–20	Extrapolation from previous year
	1996	75–125	10–20	Extrapolation from previous year
	1997	75–125	10–20	Extrapolation from previous year
	1998	75–125	10–20	Extrapolation from previous year
	1999	75–125	10–20	Extrapolation from previous year
	2000	75–125	10–20	Extrapolation from previous year
	2001	75–125	10–20	Extrapolation from previous year
25C	1992	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
	1993	75–125	10–20	Extrapolation from previous year
	1994	75–125	10–20	Extrapolation from previous year
	1995	75–125	10–20	Extrapolation from previous year
	1996	75–125	10–20	Extrapolation from previous year
	1997	75–125	10–20	Extrapolation from previous year
	1998	75–125	10–20	Extrapolation from previous year
	1999	75–125	10–20	Extrapolation from previous year
	2000	75–125	10–20	Extrapolation from previous year
	2001	75–125	10–20	Extrapolation from previous year

[a] Includes an additional 10% to account for wolves not in packs.

[b] Estimate based on assumption that all wolves in research study area were accounted for, therefore the estimate does not include the standard additional 10% to account for wolves not in packs).

[c] Mountains: 11.7 wolves/1000 km^2 × 10,775 km^2 = 126 wolves ; M McNay, Alaska Department of Fish and Game, unpublished data.

[d] Tanana Flats: Aerial reconnaissance survey (2 Feb 2002) resulted in minimum estimate of 59–68 wolves, plus a harvest of 21 wolves September 2001 through January 2002 results in fall minimum estimate of 80–89 wolves.

TABLE 2 Units 20A, 20B, 20C, 20F, and 25C wolf harvest, regulatory years 1997–1998 through 2001–2002

		Reported harvest[a]						Method of take[b]								Successful	
Unit	Regulatory year	M	F	(%)	Unk	Total	3-year mean	Trap	(%)	Snare	(%)	Shot	(%)	Unk/ Other		Trappers/ hunters	Wolves/ person
20A	1997–1998	23	21	(48)	2	46	56	19	(42)	15	(33)	11	(24)	1		24	1.9
	1998–1999	39	41	(51)	10	90	66	35	(39)	46	(51)	9	(10)	0		29	3.1
	1999–2000	41	26	(39)	0	67	68	29	(43)	24	(36)	14	(21)	0		30	2.2
	2000–2001	53	38	(44)	4	95	83	33	(36)	46	(51)	12	(13)	4		38	2.4
	2001–2002	48	39	(46)	11	98	87	37	(38)	53	(54)	8	(8)	0		32	3.0
20B	1997–1998	39	27	(41)	1	67	65	14	(21)	43	(65)	9	(14)	1		28	2.4
	1998–1999	35	36	(51)	5	76	75	18	(25)	45	(62)	10	(14)	3		32	2.4
	1999–2000	34	28	(45)	3	65	69	15	(24)	35	(56)	13	(21)	2		35	1.9
	2000–2001	48	48	(50)	3	99	80	35	(35)	48	(48)	16	(16)	0		47	2.1
	2001–2002	37	45	(55)	8	90	85	39	(44)	44	(49)	6	(7)	1		35	2.6
20C	1997–1998	9	9	(50)	0	18	21	5	(29)	10	(59)	2	(12)	1		11	1.6
	1998–1999	18	8	(31)	6	32	29	8	(25)	22	(69)	2	(6)	0		13	2.5
	1999–2000	25	14	(36)	1	40	30	14	(39)	9	(25)	13	(36)	4		19	2.1
	2000–2001	16	21	(57)	0	37	36	7	(19)	20	(54)	10	(27)	0		16	2.3
	2001–2002	7	10	(59)	0	17	31	8	(47)	5	(29)	4	(24)	0		13	1.3
20F	1997–1998	6	7	(54)	0	13	8	4	(31)	4	(31)	5	(38)	0		11	1.2
	1998–1999	2	0	(0)	0	2	8	0	(0)	2	(100)	0	(0)	0		1	2.0
	1999–2000	7	5	(42)	0	12	9	1	(8)	9	(75)	2	(17)	0		7	1.7
	2000–2001	2	2	(50)	0	4	6	0	(0)	1	(25)	3	(75)	0		4	1.0
	2001–2002	17	16	(48)	0	33	16	9	(28)	19	(59)	4	(13)	1		10	3.3
25C	1997–1998	0	1	(100)	1	2	10	2	(100)	0	(0)	0	0	0		2	1.0
	1998–1999	2	1	(33)	2	5	8	0	(0)	4	(80)	1	(20)	0		3	1.7
	1999–2000	4	4	(50)	0	8	5	2	(25)	4	(50)	2	(25)	0		6	1.3
	2000–2001	5	4	(44)	0	9	7	4	(44)	3	(33)	2	(22)	0		4	2.3
	2001–2002	1	3	(75)	7	11	9	0	(0)	8	(73)	3	(27)	0		5	2.2
Combined	1997–1998	77	65	(46)	4	146	160	44	(31)	72	(50)	27	(19)	3		76	1.9
	1998–1999	96	86	(47)	23	205	186	61	(30)	119	(59)	22	(11)	3		78	2.6
	1999–2000	111	77	(41)	4	192	181	61	(33)	81	(44)	44	(24)	6		97	2.0
	2000–2001	124	113	(48)	7	244	214	79	(33)	118	(49)	43	(18)	4		109	2.2
	2001–2002	110	113	(51)	26	249	228	93	(38)	129	(52)	25	(10)	2		95	2.6

[a] Unknown sex not used to calculate harvest percent.
[b] Unknown method of take not used to calculate harvest percent.

TABLE 3 Units 20A, 20B, 20C, 20F, and 25C wolf harvest chronology, regulatory years 1997–1998 through 2001–2002

Unit	Regulatory year	Harvest periods[a] Aug (%)	Sep–Oct (%)	Nov–Dec (%)	Jan–Feb (%)	Mar (%)	Apr (%)	Unk	n
20A	1997–1998	3 (7)	3 (7)	13 (28)	21 (46)	3 (7)	3 (7)	0	46
	1998–1999	1 (1)	8 (9)	15 (17)	52 (60)	10 (12)	0 (0)	4	90
	1999–2000	3 (4)	8 (12)	25 (37)	27 (40)	4 (6)	0 (0)	0	67
	2000–2001	1 (1)	6 (6)	27 (28)	54 (57)	4 (4)	3 (3)	0	95
	2001–2002	0 (0)	8 (8)	24 (24)	54 (55)	10 (10)	2 (2)	0	98
20B	1997–1998	0 (0)	7 (10)	21 (31)	14 (21)	20 (30)	5 (7)	0	67
	1998–1999	1 (1)	8 (11)	24 (32)	27 (36)	15 (20)	1 (1)	0	76
	1999–2000	0 (0)	10 (15)	26 (40)	22 (34)	7 (11)	0 (0)	0	65
	2000–2001	0 (0)	12 (12)	27 (28)	34 (35)	21 (21)	4 (4)	1	99
	2001–2002	0 (0)	5 (6)	34 (38)	41 (46)	8 (9)	1 (1)	1	90
20C	1997–1998	0 (0)	0 (0)	2 (12)	12 (71)	3 (18)	0 (0)	1	18
	1998–1999	0 (0)	1 (3)	10 (31)	11 (34)	10 (31)	0 (0)	0	32
	1999–2000	0 (0)	9 (23)	10 (25)	20 (50)	1 (3)	0 (0)	0	40
	2000–2001	0 (0)	6 (16)	18 (49)	9 (24)	2 (5)	2 (5)	0	37
	2001–2002	0 (0)	1 (6)	7 (41)	5 (29)	2 (12)	2 (12)	0	17
20F	1997–1998	0 (0)	3 (23)	3 (23)	5 (38)	2 (15)	0 (0)	0	13
	1998–1999	0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	0 (0)	0	2
	1999–2000	0 (0)	2 (17)	5 (42)	2 (17)	3 (25)	0 (0)	0	12
	2000–2001	1 (25)	2 (50)	0 (0)	0 (0)	1 (25)	0 (0)	0	4
	2001–2002	0 (0)	3 (9)	14 (42)	12 (36)	3 (9)	1 (3)	0	33
25C	1997–1998	0 (0)	0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	0	2
	1998–1999	0 (0)	0 (0)	0 (0)	2 (40)	2 (40)	1 (20)	0	5
	1999–2000	0 (0)	2 (25)	3 (38)	3 (38)	0 (0)	0 (0)	0	8
	2000–2001	0 (0)	2 (22)	0 (0)	4 (44)	3 (33)	0 (0)	0	9
	2001–2002	1 (9)	1 (9)	6 (55)	3 (27)	0 (0)	0 (0)	0	11
20A, B, C, F, and 25C	1999–2001	6 (1)	77 (11)	226 (33)	290 (42)	69 (10)	15 (2)	2	685

[a] Unknown harvest period not used to calculate harvest percent.

TABLE 4 Units 20A, 20B, 20C, 20F, and 25C wolf harvest by transport method, regulatory years 1997–1998 through 2001–2002

		Harvest by transport method[a]															
Unit	Regulatory year	Airplane	(%)	Dog sled, skis, snowshoe, or horse	(%)	Boat	(%)	3- or 4-wheeler	(%)	Snowmachine	(%)	ORV	(%)	Highway vehicle	(%)	Unk	*n*
20A	1997–1998	0	(0)	7	(16)	0	(0)	1	(2)	29	(64)	1	(2)	7	(16)	1	46
	1998–1999	10	(12)	3	(4)	1	(1)	2	(2)	66	(79)	1	(1)	1	(1)	6	90
	1999–2000	4	(6)	4	(6)	0	(0)	4	(6)	51	(81)	0	(0)	0	(0)	4	67
	2000–2001	29	(32)	5	(5)	1	(1)	1	(1)	54	(59)	0	(0)	1	(1)	4	95
	2001–2002	6	(6)	5	(5)	0	(0)	4	(4)	80	(82)	3	(3)	0	(0)	0	98
20B	1997–1998	2	(3)	1	(2)	0	(0)	3	(5)	53	(80)	0	(0)	7	(11)	1	67
	1998–1999	1	(1)	3	(4)	0	(0)	2	(3)	54	(75)	0	(0)	12	(17)	4	76
	1999–2000	1	(2)	2	(3)	5	(8)	0	(0)	49	(79)	0	(0)	5	(8)	3	65
	2000–2001	1	(1)	6	(6)	3	(3)	4	(4)	78	(79)	0	(0)	7	(7)	0	99
	2001–2002	1	(1)	3	(3)	0	(0)	0	(0)	79	(91)	0	(0)	4	(5)	3	90
20C	1997–1998	3	(18)	2	(12)	0	(0)	0	(0)	12	(71)	0	(0)	0	(0)	1	18
	1998–1999	0	(0)	7	(23)	1	(3)	0	(0)	22	(73)	0	(0)	0	(0)	2	32
	1999–2000	0	(0)	3	(8)	5	(13)	3	(8)	27	(68)	2	(5)	0	(0)	0	40
	2000–2001	5	(14)	5	(14)	0	(0)	6	(16)	21	(57)	0	(0)	0	(0)	0	37
	2001–2002	3	(18)	1	(6)	0	(0)	0	(0)	13	(76)	0	(0)	0	(0)	0	17
20F	1997–1998	1	(8)	2	(15)	1	(8)	0	(0)	7	(54)	0	(0)	2	(15)	0	13
	1998–1999	0	(0)	0	(0)	0	(0)	0	(0)	2	(100)	0	(0)	0	(0)	0	2
	1999–2000	0	(0)	0	(0)	0	(0)	0	(0)	7	(78)	0	(0)	2	(22)	3	12
	2000–2001	0	(0)	1	(25)	0	(0)	1	(25)	1	(25)	0	(0)	1	(25)	0	4
	2001–2002	1	(3)	0	(0)	1	(3)	0	(0)	28	(85)	0	(0)	3	(9)	0	33
25C	1997–1998	0	(0)	0	(0)	0	(0)	0	(0)	2	(100)	0	(0)	0	(0)	0	2
	1998–1999	2	(40)	0	(0)	0	(0)	0	(0)	2	(40)	0	(0)	1	(20)	0	5
	1999–2000	1	(17)	0	(0)	0	(0)	0	(0)	4	(67)	0	(0)	1	(17)	2	8
	2000–2001	0	(0)	0	(0)	1	(11)	1	(11)	7	(78)	0	(0)	0	(0)	0	9
	2001–2002	0	(0)	0	(0)	0	(0)	2	(18)	8	(73)	0	(0)	1	(9)	0	11
20A, B, C, F, and 25C	1999–2001	52	(8)	35	(5)	16	(2)	26	(4)	507	(76)	5	(1)	25	(4)	19	685

[a] Unknown transport not used to calculate harvest percent.

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNIT: 20D (5637 mi^2)

GEOGRAPHIC DESCRIPTION: Central Tanana Valley near Delta Junction

BACKGROUND

Wolves are present throughout Unit 20D where their primary prey are moose, caribou, and Dall sheep. Wolf and prey numbers were high in Unit 20D during the 1960s. The population was an estimated 200–250 wolves at that time (38.3–48.2 wolves/1000 mi^2 or 14.8–18.6 wolves/1000 km^2). Moose populations began to decline in the mid 1960s, and a wolf reduction program was authorized in 1979 to increase moose numbers (ADF&G 1984). That program included aerial shooting permits issued to the public. From fall 1979 to spring 1983, 105 wolves were removed by trappers, ADF&G staff, and hunters with permits for aerial shooting. Most wolves were taken in southern and eastern Unit 20D (ADF&G 1983). Since the wolf reduction program ended in spring 1983, all wolf harvest has been by hunting or trapping. In March 1995 the Alaska Board of Game adopted an intensive management program for Unit 20D and determined that the preferred use of moose and caribou in Unit 20D was for human consumption. As a result, the board adopted a 5-year wolf control implementation plan that authorized the Commissioner to conduct a wolf population reduction or regulation program in Unit 20D except on Fort Greely Military Reservation and within the Fortymile Nonlethal Predation Control Area. The program became effective 1 July 1997 and expired 30 June 2002 without any wolf reduction program specifically targeting Unit 20D, although wolves were reduced in portions of northern Unit 20D as part of the Fortymile Nonlethal Predation Control program.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. The domestication of wolves for personal use or for

commercial purposes is generally considered incompatible with department management policies.

Management may include manipulation of wolf population size and total protection of wolves from human influence. Not all human uses will be allowed in all areas or at all times. Management will focus on providing sustained, diverse human uses of wolf populations consistent with goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Alaska Board of Game 30 October 1991 and revised 29 June 1993. Those goals are:

- Ensure the long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.

- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.

- Increase public awareness and understanding of the uses, conservation and management of wolves, their prey and habitat in Alaska.

MANAGEMENT OBJECTIVES

- Manage harvest to maintain a population of between 15 and 125 wolves.

MANAGEMENT ACTIVITIES

- Conduct wolf predation control reduction programs as directed by the commissioner and the Board of Game.

- Provide trapper education programs to improve trapper skills, ethics, and regulatory compliance.

- Model the potential effects of wolf predation on ungulates within Unit 20D.

METHODS

We estimated wolf population size using aerial surveys; observations of packs with radiocollared wolves; interviews with local trappers, hunters, and pilots; and information about pack size recorded on fur sealing certificates. Aerial surveys were conducted by flying major rivers, creeks, exposed ridges, and other locations and searching for wolf tracks. When tracks were located, the number of wolves and their direction of travel were determined. Survey information was recorded on topographic maps. Information from interviews with knowledgeable local pilots, hunters, and trappers was also used to determine pack size. Wolves harvested during the winter were added to spring pack size if known, to estimate fall pack size prior to hunting and trapping season. In some cases, fall pack size was known for packs observed during that time period. Trapper reports of pack size were used in some cases, if the observation was deemed accurate. After all pack counts were tallied, the subunit

population estimate was increased by 10% to account for lone wolves not associated with a pack.

Several wolf packs, including the 100-Mile Creek pack in Unit 20A and the West Fork Charley River and the Middle Fork Fortymile River packs from Unit 20E were included in the Unit 20D population estimate by calculating a Unit 20D "pack equivalent" based on the estimated home range within Unit 20D. The pack equivalents were 20% for the 100-Mile Creek, 50% for the Middle Fork Fortymile pack, and 70% for the West Fork Charley River pack. Therefore, the estimated pack size was multiplied by the pack equivalent to calculate a pack size for the Unit 20D population estimate. Population data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY99 = 1 Jul 1999 through 30 Jun 2000).

Harvested wolves were sealed with locking tags and we recorded date of kill, name of trapper or hunter, kill location, method of take and transportation, sex of the wolf, pelt color, and estimated pack size. Harvest data were summarized by regulatory year.

Unit 20D was subdivided into 2 areas for calculating population estimates, using the Tanana River as the boundary. The portion of Unit 20D south of the Tanana River is southern Unit 20D. The portion of Unit 20D north of the Tanana River is northern Unit 20D.

Wolves from some northern Unit 20D packs were radiocollared as part a research project conducted in the Fortymile Nonlethal Predation Control Area. Dominant wolves within some of these packs were sterilized and other members of those packs were relocated to areas outside Unit 20D (Boertje and Gardner 2000).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The RY99–RY01 reporting period was characterized by very poor wolf survey conditions, making accurate wolf population estimates difficult to calculate and compliance with management objectives difficult to determine. Although wolf population data is also obtained from trapper interviews and other observations, that information can be difficult to interpret without correlative aerial survey data.

RY99. An aerial wolf survey was flown in southern Unit 20D on 28 March 2000 with 2 aircraft for a combined 6.5 hours of survey time. Additional surveys were cancelled because survey conditions were poor. Intensive tracking of radiocollared wolves in northern Unit 20D occurred as part of the Fortymile Nonlethal Predation Control program. An accurate fall RY99 population estimate was not possible, however I calculated a minimum fall RY99 estimate of 117–118 wolves.

In southern Unit 20D we sighted 9 wolves in the Macomb pack on 28 March 2000. An additional 26 wolves were killed by trappers and hunters during RY99. Therefore, a minimum

of 35 wolves ranged within southern Unit 20D but accurate pack size information was not available for the other southern Unit 20D packs.

The fall RY99 northern Unit 20D estimate of 78–81 wolves in 8 packs was more accurate than the southern estimate because we intensively monitored northern Unit 20D during implementation of the Fortymile Nonlethal Predation Control program. That estimate also includes a pack of 7 wolves (West Fork Charley River pack) that denned in the Yukon–Charley National Preserve but wintered in northern Unit 20D. The Indian–Tibbs pack and the Black Mountain–Harper pack remained small with 2 and 3 wolves respectively, after the dominant pairs were sterilized and other pack members were relocated.

The Unit 20D RY99 fall population contained at least 117 wolves, (41 wolves/1000 mi^2, 9.4–9.5 wolves/1000 km^2; Table 1) and probably exceeded the population objective of 125 wolves. During winter 1999–2000, additional northern Unit 20D packs were treated during the Fortymile Nonlethal Predation Control program. Nine wolves were relocated from the Healy River pack and the dominant pair was sterilized. Also, 4 wolves were relocated from the Eisenmenger Pack and the dominant pair was sterilized. By spring 2000 the dominant pairs of 4 northern Unit 20D packs had been sterilized.

RY00. Spring aerial wolf surveys were flown in southern Unit 20D for 14.9 hours on 15 and 22 February and 17–18 March 2001. Survey conditions were poor and additional aerial surveys were not possible. In addition, intensive tracking of radiocollared wolves in northern Unit 20D occurred as part of the Fortymile Nonlethal Predation Control program.

The southern Unit 20D population fall estimate included 44–47 wolves in 4 packs, plus a pack equivalent of 2 wolves for the 100–Mile Creek pack in Unit 20A. An additional 10% for "loners" was included, resulting in a southern Unit 20D population estimate of 48–51 wolves.

The northern Unit 20D population estimate was 42–44 wolves in 10 packs. That estimate included 4 sterilized packs, and 2 pack equivalents of 6 wolves for the West Fork Charley River pack and 1 wolf for the Unit 20E Middle Fork Fortymile River pack. Including 10% loners increased the population estimate to 46–48 wolves.

The Unit 20D RY00 population estimate of 94–99 wolves resulted in an estimated density of 19.6–20.6 wolves/1000 mi^2 (7.6–8.0 wolves/1000 km^2) within an estimated 4800 mi^2 of wolf habitat (Table 1). Those estimates met the population objective of 15–125 wolves in the unit.

Using RY00 wolf population estimates and a 1999–2000 Unit 20D moose population estimate of 6327 moose (RY99 northern Unit 20D = 2395; RY00 southern Unit 20D = 3932) results in Unit 20D moose:wolf ratios of 65 moose:wolf. The southern Unit 20D ratio is 79 moose:wolf and the northern ratio is 51 moose:wolf. Gasaway et al. (1983) predicted that moose:wolf ratios of >30 would not limit moose population growth without other adverse conditions.

RY01. Aerial wolf surveys were flown in southern Unit 20D on 22 January and 1 February 2002 for 4.0 hours each day. Additional surveys were not possible due to poor snow and survey conditions. Intensive tracking of radiocollared wolves in northern Unit 20D also occurred as part of the Fortymile Nonlethal Predation Control program.

The southern Unit 20D population estimate was 46–52 wolves in 5 packs plus a pack equivalent of 1 wolf for the 100-Mile Creek pack. Including 10% loners increased the population estimate to 51–57 wolves. Part of the increased estimate over RY00 includes the estimate of 17 wolves in the Gerstle pack. This large pack was observed by several trappers and appears to be a reliable estimate.

The northern Unit 20D population estimate was 45 wolves in 8 packs including pack equivalents of 5 wolves for the West Fork Charley River pack and 2 wolves for the Middle Fork Fortymile River pack. Adding 10% loners increased the estimate to 49 wolves. This estimate includes 3 packs that consist only of sterilized pairs.

The Unit 20D RY01 population estimate of 100–106 wolves in 13 packs resulted in a density estimate of 20.8–22.1 wolves/1000 mi^2 (8.1–8.5 wolves/1000 km^2;Table 1). The population met the management objective of 15–125 wolves.

Using RY01 wolf population estimates and a 1999–2001 Unit 20D moose population estimate of 5830 moose (RY99 northern Unit 20D = 2395; RY01 southern Unit 20D = 3435) results in Unit 20D moose:wolf ratios of 57 moose:wolf. The southern Unit 20D ratio is 64 moose:wolf and the northern ratio is 49 moose:wolf. Gasaway et al. (1983) predicted that moose:wolf ratios of >30 would not limit moose population growth without other adverse conditions.

Distribution and Movements

Wolves from several packs in northern Unit 20D were radiocollared as part of the Fortymile Caribou Herd Nonlethal Predation Control Program. Boertje and Gardner (2000) reported movements of these wolves.

MORTALITY

Harvest

Season and Bag Limit.

Unit/Bag Limit/ Special Restrictions	Resident Open Seasons	Nonresident Open Seasons
Unit 20D		
RY99		
HUNTING: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit. No same-day-airborne shooting of wolves, except wolves caught in a trap or snare. No trapping with a steel trap or with a snare smaller than 3/32" in diameter during April or October.	15 Oct–30 Apr	15 Oct–30 Apr

Unit/Bag Limit/ Special Restrictions	Resident Open Seasons	Nonresident Open Seasons
RY00		
HUNTING: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit. A wolf may be shot same day airborne if caught in a trap or snare. No trapping with a steel trap or with a snare smaller than 3/32" in diameter during April or October.	15 Oct–30 Apr	15 Oct–30 Apr
RY01		
HUNTING: 5 wolves. No wolf hunting same-day-airborne.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit. A wolf may be shot same day airborne if caught in a trap or snare. Wolves may be taken from a snowmachine in active wolf management areas in Unit 20D outside of the Fort Greely Military Reservation or the Fortymile Nonlethal Predation Control Area. No trapping with a steel trap or with a snare smaller than 3/32" in diameter during April or October.	15 Oct–30 Apr	15 Oct–30 Apr

Alaska Board of Game Actions and Emergency Orders. Legislative actions taken relative to wolves are noteworthy, although they are not emergency orders or Alaska Board of Game actions. In 1999 the Alaska legislature passed a bill allowing the public to shoot wolves the same day they had been airborne in areas where the Board of Game had authorized predator control. This included Unit 20D except those portions within the Fort Greely Military Reservation and within the Fortymile Nonlethal Predation Control Area. Governor Knowles then vetoed the bill but the legislature overrode the veto. A ballot initiative that passed November 2000 reversed the legislative override and again prohibited same-day-airborne hunting of wolves in areas previously authorized for wolf control by the Board of Game.

For the RY00 trapping season, the Alaska Board of Game passed a regulation that authorized taking wolves from a snowmachine in Unit 20D except those portions within the Fort Greely Military Reservation and within the Fortymile Nonlethal Predation Control area.

Hunter–Trapper Harvest. Hunters and trappers reported taking 42 wolves in RY99, 41 in RY00, and 50 in RY01 (Table 2). The mean annual harvest of 44 wolves during the RY99–RY01 reporting period was higher than the average of 31 wolves/year during the previous 3 years. During RY99–RY01, 50% of harvested wolves were male, 43% were female, and 7% were unknown sex.

No harvest rate was calculated for RY99 because an accurate population estimate was not calculated. In RY00, trappers and hunters took 41–44% of the estimated fall population. In RY01, wolf mortality was an estimated 47–50% of the estimated fall population. The National Research Council (1997) reported that determining sustainable levels of wolf harvest is difficult, but estimates of sustainable rates of harvest vary from less than 30% up to 40% of early winter populations. Therefore, wolf harvest, combined with nonlethal control of several packs in northern Unit 20D, likely exceeded sustainable levels during this reporting period. However, the population is near the upper population objective and these harvest rates are not a concern at this time.

Most wolves were taken each year by trapping and snaring. Eighty-seven percent of all wolves taken from RY99–RY01 were killed in traps or snares (Table 2).

Trappers and hunters took more wolves from southern than from northern Unit 20D during RY99–RY01 (Table 3). Among wolves with known harvest locations, 67% were taken in southern Unit 20D, probably because road and trail access is better in the southern part of the unit.

Harvest Chronology. There were no significant changes in wolf harvest chronology during RY99–RY01. Most wolves were harvested during November through March (Table 4).

Transport Methods. Snowmachines and highway vehicles were the most common mode of transportation used by trappers and hunters who harvested wolves (Table 5). Snowmachines were used to take 70% of the wolves during RY99–RY01, and highway vehicles were used to take 18%.

CONCLUSIONS AND RECOMMENDATIONS

During RY99–RY01 we met the wolf management objective to maintain a population of 15–125 wolves and conducted wolf management activities, as established by the Alaska Board of Game. Recent harvest rates combined with experimental relocation and sterilization of wolves from Unit 20D in the Fortymile Nonlethal Predation Control Area have reduced wolves in northern Unit 20D below levels achieved by trapping alone. Because the Alaska Board of Game has determined that human use of moose and Macomb caribou in Unit 20D is the preferred use, and have adopted a wolf control implementation plan for wolves in Unit 20D, the current harvest rate is acceptable until the wolf population is reduced to the lower limit of the population objective. No regulatory changes are recommended at this time. However, the

wolf control implementation plan adopted as 5 AAC 92.125 expired on 30 June 2002. The plan and management objectives should be reevaluated during the next reporting period.

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TABLE 1 Unit 20D fall wolf population estimate, regulatory years 1996–1997 through 2001–2002

Area	Regulatory year (30 Jun–1 Jul)					
	1996–1997	1997–1998	1998–1999	1999–2000	2000–2001	2001–2002
Southern Unit 20D[a,b]	32–40	31–34	–[c]	35[c]	44–47	46–52
Northern Unit 20D[d]	54–57	75–77	56–58	71–74	42–44	45
Unit 20D subtotal	86–97	106–111	–[c]	106–107[c]	86–91	91–97
Estimate 10% "loners"	9–10	11	–[c]	11	8	9
Unit 20D total	96–107	117–122	–[c]	117–118[c]	94–99	100–106
Estimated wolves/1000 km^2	7.1–7.9	8.7–9.1	–[c]	9.4–9.5[c]	7.6–8.0	8.1–8.5

[a] Includes a “pack equivalent” calculation for the 100-Mile Creek pack which overlaps eastern Unit 20A.

[b] Unit 20D south of the Tanana River.

[c] No estimate or minimum estimate due to poor spring survey conditions.

[d] Unit 20D north of the Tanana River.

TABLE 2 Unit 20D wolf harvest, regulatory years 1985–1986 through 2001–2002

Regulatory	Reported harvest			Estimated harvest		Method of take				
year	M	F	Unk	Unreported	Illegal	Trap/snare	Shot	SDA[a]	Unk	Total
1985–1986	17	10	1	0	0	19	0	9	0	28
1986–1987	11	7	0	0	0	18	0	0	0	18
1987–1988	5	7	0	0	0	11	1	0	0	12
1988–1989	5	12	4	0	0	20	1	0	0	21
1989–1990	2	4	0	0	0	4	2	0	0	6
1990–1991	8	13	2	0	0	6	4	13	2	23
1991–1992	4	3	2	0	0	3	5	1	0	9
1992–1993	8	9	5	0	0	16	6	0	0	22
1993–1994	17	27	4	0	0	37	10	0	1	48
1994–1995	16	9	0	0	0	24	1	0	0	25
1995–1996	16	24	1	0	0	39	1	0	1	41
1996–1997	17	10	1	0	0	22	6	0	0	28[b]
1997–1998	22	15	4	0	0	37	3	0	1	41[c]
1998–1999	14	9	2	0	0	24	1	0	0	25[d]
1999–2000	19	19	4	0	0	34	8	0	0	42
2000–2001	21	16	4	0	0	33	8	0	0	41
2001–2002	27	22	1	0	0	49	1	0	0	50

[a] SDA refers to animals taken by hunters the same day hunters were airborne.
[b] An additional 4 wolves were relocated from northern Unit 20D to another area.
[c] An additional 6 wolves were relocated from northern Unit 20D to another area.
[d] An additional wolf was relocated from northern Unit 20D to another area.

TABLE 3 Unit 20D Wolf harvest by location, regulatory years 1996–1997 through 2001–2002

Regulatory year	North of Tanana River	South of Tanana River	Unknown
1996–1997	10	18	
1997–1998	17	24	
1998–1999	12	13	
1999–2000	13	28	1
2000–2001	12	29	
2001–2002	18	32	

TABLE 4 Unit 20D wolf harvest chronology, regulatory years 1985–1986 through 2001–2002

Regulatory year	Harvest periods											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	*n*
1985–1986		0	0	0	4	3	4	5	8	2	2	28
1986–1987		0	0	0	0	2	8	2	6	0	0	18
1987–1988		1	0	0	4	0	1	6	0	0	0	12
1988–1989		0	0	0	0	5	5	10	0	1	0	21
1989–1990		0	1	0	0	3	0	0	2	0	0	6
1990–1991		0	0	2	2	0	0	3	16	0	0	23
1991–1992		0	2	0	0	2	1	1	3	0	0	9
1992–1993		1	1	0	2	8	0	4	3	2	1	22
1993–1994		0	5	0	6	11	6	4	16	0	0	48
1994–1995		0	1	0	0	3	6	8	6	1	0	25
1995–1996		0	0	0	9	7	8	7	9	1	0	41
1996–1997	0	2	2	1	6	4	4	7	1	0	0	27
1997–1998	1	0	1	0	9	9	8	3	9	1	0	41
1998–1999	0	0	0	0	6	8	4	5	2	0	0	25
1999–2000	0	0	2	0	5	7	9	16	11	2	0	42
2000–2001	0	1	3	1	9	6	5	7	6	3	0	41
2001–2002	0	0	0	0	15	12	6	11	4	1	1	50

TABLE 5 Unit 20D wolf harvest by transport method, regulatory years 1985–1986 through 2001–2002

Regulatory year	Harvest by transportation method									*n*
	Airplane	Dogsled, Horse	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Ski, Walk	Unk	
1985–1986	10	0	0	0	16	0	1		1	28
1986–1987	1	1	0	0	16	0	0		0	18
1987–1988	1	5	0	0	4	0	1		1	12
1988–1989	0	0	0	0	21	0	0		0	21
1989–1990	0	0	0	0	4	1	0		1	6
1990–1991	15	0	0	0	4	1	3		0	23
1991–1992	1	0	0	0	6	0	2		0	9
1992–1993	10	0	0	1	8	1	0		2	22
1993–1994	7	0	0	0	34	0	5		2	48
1994–1995	0	1	0	0	17	0	6		1	25
1995–1996	1	2	0	2	22	1	13		0	41
1996–1997	1	2	0	1	13	1	8		0	27
1997–1998	0	4	0	0	22	0	6	9	0	41
1998–1999	0	3	0	1	11	0	10	0	0	25
1999–2000	0	0	1	2	26	2	7	4	0	42
2000–2001	1	0	1	1	27	1	8	2	0	41
2001–2002	0	0	0	1	40	0	9	1	0	50

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNIT: 20E (10,680 mi^2)

GEOGRAPHIC DESCRIPTION: Fortymile, Ladue, and Charley River drainages

BACKGROUND

Since the 1940s wolf numbers in Unit 20E have fluctuated due to federal and state wolf control programs, harvest pressure, and ungulate densities. Murie (1944) reported that wolves were abundant in the region during the 1940s but were rapidly reduced by a federal predator reduction program during 1948–1960 (Gasaway et al. 1992). Wolves were killed by poison, cyanide guns, disrupting dens, year-round trapping, and aerial shooting. Once the control program ceased in 1960, wolves rapidly increased and were abundant by the mid 1960s in Unit 20E. The wolf population declined during the mid 1970s due to reduced moose and caribou populations (Gasaway et al. 1992).

Between 1975 and 1981, the wolf population was stable at relatively low densities and was food limited (Gasaway et al. 1992). The population was lightly harvested ($\bar{x}$ = 11% annual harvest rate). During 1981–1983 a wolf control program was conducted by the Alaska Department of Fish and Game (ADF&G) in a 6000-mi^2 area primarily located in Unit 20E. The combination of wolf control and public trapping reduced the wolf population by 73% by spring 1983. Subsequent harvest by public hunters and trappers maintained the population below precontrol size through 1986. Wolf productivity increased following control efforts (Gasaway et al. 1992). During the late 1980s the wolf population in Unit 20E increased by approximately 17% annually, reaching an estimated 230 wolves in 1990. Between 1990 and 1995 wolf numbers fluctuated but overall remained stable.

Historically, wolf harvest in Unit 20E had little effect on wolf population trend. However, during some years, moderate to high harvests caused population declines in accessible areas. Wolf trapping intensity is primarily affected by the fur market, but it also is affected by trapping methods and means. When marten and lynx fur prices are high, most area trappers spend less time trapping wolves. Also, wolf trapping pressure in Unit 20E was higher when land-and-shoot taking of wolves was legal because local trappers who used airplanes for access would take more wolves incidentally to marten trapping and also because more nonlocal wolf trappers traveled to the area. During 1995 and 1996, wolf harvest was higher due to a privately funded wolf harvest

incentive program designed to increase wolf kill within the summer and winter ranges of the Fortymile caribou herd. Under this program, trapper harvest reduced the wolf population in portions of the herd's range.

Since 1980, 2 wolf control programs were implemented to increase ungulate populations. The effects of the 1981–1983 wolf control program were difficult to interpret because the program was terminated prematurely and adequate removal rates were not obtained. Neither moose nor caribou calf survival increased due to control efforts. The wolf control area did not overlap any of the caribou herd's calving range. Gasaway et al. (1992) concluded that in Unit 20E wolf predation on moose calves was not a detectable source of additive mortality when grizzly bears were abundant. Adult moose and caribou survival did increase during wolf control. The treatment area happened to include the area where most of the caribou herd wintered during 1981–1983. Increased adult moose and caribou survival was documented following other wolf control programs (Boertje and Gardner 2000; Valkenburg et al. 2002; Hayes et al., in press; B Hayes, personal communication). Overall, moose and caribou numbers increased following wolf control but at rates comparable to adjacent control populations. Aside from inadequate wolf removal, favorable weather conditions prevailed during this period and appeared to benefit moose and caribou populations throughout the area, increasing the difficulty in interpreting the effects of wolf control.

During the 1980s and 1990s, wildlife agencies in Alaska and Canada experienced difficulties in implementing and completing wolf management programs due to opposition from a variety of public groups. Philosophical differences concerning wolf management have caused heated disagreements and divisiveness between wildlife proponents. Most of the local residents in Unit 20E and adjacent Unit 12 support an intensive management program designed to increase caribou and moose numbers. Following the premature stoppage of the 1981 wolf control program and Governor Hickel's decision in 1992 to rescind a wolf control program scheduled to begin in 1993, it became evident that a wolf management program designed to help ungulate populations recover in Unit 20E must include diverse public views concerning wildlife management and all of the responsible agencies.

In February 1994 a planning group was formed (Fortymile Caribou Herd Management Team). The process was started by the public and included 14 public members representing a wide range of special interest groups and 5 management agencies. The team agreed to the goal of trying to manage for the recovery of the Fortymile caribou herd using a series of management steps designed to conserve habitat, reduce caribou harvest, and reduce wolf predation. The team developed a plan that recommended a combination of public trapping and state-conducted nonlethal wolf control to reduce wolf predation on Fortymile caribou. Before the predator control recommendations in the plan were implemented, they had to meet the following criteria established by Governor Knowles: 1) scientific merit; 2) economic value; and 3) public acceptance. The Alaska Board of Game adopted the implementation plan in spring 1996, and Governor Knowles allowed the nonlethal wolf control program to begin in fall 1997 after reviewing the program relative to these 3 criteria.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

The wolf management goals in Unit 20E follow the goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Board of Game on 30 October 1991 and revised 29 June 1993. Those goals are to:

- Ensure the long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.
- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and that reflect the public's interest.
- Increase public awareness and understanding of the uses, conservation and management of wolves, their prey, and habitat in Alaska.

MANAGEMENT OBJECTIVES

Objectives will be formulated by 30 June 2005.

MANAGEMENT ACTIVITIES

- Provide opportunity to participate in hunting, trapping, and viewing wolves.
- Monitor harvest through sealing records and trapper questionnaires.
- Temporarily close wolf trapping if the unit population declines below 50 wolves.
- Monitor wolf numbers and population characteristics.
- Conduct fixed-wing aerial surveys to determine wolf density, number of packs, and pack size in a 4600-mi^2 trend area that encompasses portions of Units 20E and 12.
- Radiocollar selected packs to monitor wolf recovery within the Fortymile nonlethal wolf control area.
- Increase public awareness of wolf population trends, effects on moose and caribou populations, and management directions.

METHODS

ESTIMATING WOLF POPULATION SIZE

Wolf population size and trend was estimated in all or portions of Unit 20E using aerial wolf surveys (Stephenson 1978; Gasaway et al. 1983), standard radiotelemetry techniques, wolf observations by area pilots and trappers, and sealing (Table 1). In winter 2002–2003 we developed a wolf population trend area (about 4600 mi^2) encompassing portions of Units 12,

20E, and 20D. All estimates of wolf numbers were increased by 10% to account for lone wolves present but not found (Mech 1973). All wolf packs that had territories wholly or partially in Unit 20E or the specific study areas were included in the estimates. Population data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY01= 1 Jul 2001 through 30 Jun 2002).

WOLF POPULATION CHARACTERISTICS

Within the Fortymile caribou herd's range, we captured 320 wolves between 1991 and 2002. Before November 1997 all wolves captured were radiocollared to help us evaluate wolf movements and numbers. Usually 2–3 wolves per pack were radiocollared. Since November 1997 we relocated 140 wolves from 15 packs; 30 of these wolves were radiocollared. We sterilized 41 adult wolves (23 females and 18 males) and radiocollared them to 1) evaluate the efficacy of fertility control, 2) determine if the sterilized pair maintained their alpha status and territory, 3) monitor the pairs' movement patterns, and 4) determine survival rates. Wolves captured outside of the nonlethal control treatment area were part of packs we used as control packs to evaluate the effects of relocation and sterilization. Blood samples and body measurements were routinely taken from all captured wolves. Radiocollared wolves were located periodically to determine pack and territory size, movement patterns, and population demographics.

NONLETHAL WOLF CONTROL

During November 1997–May 2001, we captured and relocated all subordinate wolves and sterilized the 2 alpha wolves in 15 packs most accountable for Fortymile caribou calf mortality (excluding the packs that resided within Yukon–Charley Rivers National Preserve). Capture methods are outlined in Boertje and Gardner (2000). Relocated wolves were moved >100 miles from their original territory in 1997 and >200 miles during 1998–2001 to minimize the chance of their return. These wolves were released in areas that supported ungulate densities as high or higher than in their original territory. The dominant wolves were sterilized by veterinary surgeons. Males were vasectomized and females were tubal ligated to retain gonadal cycling. The sterilized wolves were kept overnight for observation to ensure they completely recovered from the immobilizing drug before release and on the following day were released at or near the point of capture.

HARVEST MONITORING

We determined harvest statistics from sealing documents and fur acquisition reports. An official ADF&G seal must be attached to all wolves taken in Alaska. During the sealing process, information is collected on specific location and method of take, date, sex, color of pelt, estimated size of the wolf pack, and transportation. Harvest data were summarized by regulatory year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We conducted thorough fall wolf surveys in most of Unit 20E during RY91, RY92, RY95, and RY96–RY98. During the report period (RY99–RY01), most of our efforts were focused on monitoring wolf recovery within the nonlethal wolf control area and therefore did not obtain population estimates for the subunit. During February–April RY02 we surveyed about 4300 mi^2 of the Units 20E and 12 trend area and found 18 packs ranging from 2 to 16 wolves and observed 124–127 different wolves, 3 of which were singles. Average pack size was 6.7 wolves. The minimum density, including an estimate for single wolves, was 12.1 wolves/1000 km^2 (31.3 wolves/1000 mi^2). This is an overestimate because it gave equal weight to border packs without considering the juxtaposition of their territory in relation to the survey boundaries. By deleting half of the border packs from the estimate, density becomes 8.9 wolves/1000 km^2 (23.1 wolves/1000 mi^2).

Based on the RY02 survey, the wolf population increased during the report period. During the 1980s and 1990s, estimated wolf densities ranged between 6 and 7 wolves/1000 km^2 (15.5 and 18.1 wolves/1000 mi^2). The trend area was designed to include areas with varying densities of moose and caribou and different trapping intensities with the objective that wolf densities and population trends in the study area would indicate densities and trends throughout Unit 20E. However, this method has some limits because some effects of the nonlethal wolf control program (sterilization) do not mimic trapping or other environmental factors. Instead of extrapolating strictly on survey results, I determined the unit estimate by adding the number of wolves within the wolf treatment area to the estimate generated for the remainder of the unit determined by the survey. I estimated 245–260 wolves in Unit 20E before trapping season, the highest estimate since 1990 and a 20% increase since RY99.

Wolf population trends in Unit 20E during the 1990s was discussed in Gardner (2000). In brief, the population increased during RY90–RY95, declined slightly during RY96–RY99, and increased during RY00–RY02. The cause of increasing population during the report period is likely increased productivity and survival due to a greater prey base and reduced harvest mortality. Since 1997 the caribou numbers have increased substantially in Unit 20E; the Fortymile Herd (46,000 caribou and increasing) spends 8–10 months in the unit and 5000–30,000 Nelchina caribou occupy Unit 20E between November and April. In addition, the snowshoe hare population was high from RY99 through RY00.

MORTALITY

Harvest

Units and Bag Limits	Resident Open Seasons	Nonresident Open Seasons
Unit 20E.		
HUNTING: 5 wolves. No wolf hunting same day airborne.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit. No trapping with a steel trap or a snare smaller than 3/32 inch in diameter during April or October.	15 Oct–30 Apr	15 Oct–30 Apr

Alaska Board of Game Actions and Emergency Orders. In November 1996, Alaskan voters passed an initiative that prohibited same-day-airborne hunting of wolves, fox, lynx, and wolverine. This initiative became effective on 25 February 1997. In spring 1999 the Alaska Legislature passed a law allowing the same-day-airborne taking of wolves in specific intensive management areas that included adjacent Unit 20D and could have affected several Unit 20E packs. An initiative to overturn this decision was passed by Alaskan voters in November 2000, and resulted in stopping same-day-airborne hunting in February 2001. No wolves from these Unit 20D/20E border packs were known to be taken under this regulation.

During their spring 1997 meeting, the board adopted the Fortymile Nonlethal Wolf Control Implementation Plan as regulation which allowed nonlethal wolf control in portions of Units 20E, 20B, and 20D until June 2001. The regulation was implemented in November 1997 after Governor Knowles ruled in its favor. As directed, nonlethal wolf control ended by June 2001.

During their spring 1998 meeting, the board designated the Unit 20E moose population within the Fortymile and Ladue River drainages and the Fortymile caribou herd as important for high levels of human consumptive use under the intensive management law (AS 16.05.255[e]–[g]). This designation means the board must consider intensive management if regulatory action to significantly reduce moose or caribou harvest in Unit 20E becomes necessary because the population is depleted or has reduced productivity. Wolf control has been identified by the legislature as an important management tool consistent with the intent of the intensive management law. As of May 2002 the caribou population and harvest objectives were being met but the moose objectives were not.

Hunter–Trapper Harvest. The reported annual Unit 20E wolf harvest was 31, 50, and 32 wolves during RY99, RY00, and RY01, respectively (Table 2). Estimated annual harvest rates were 13–21% less than the estimated maximum sustainable harvest rate of 25–30%. Harvest has been less than the maximum sustainable rate since RY95.

Elevated harvest during RY95 and RY96 in portions of Unit 20E was due to the Fortymile Caribou Calf Protection Program developed by trappers to assist the recovery of the Fortymile caribou herd. To stimulate harvest, this group paid $400/wolf caught within the range of the Fortymile Herd. This payment approximately doubled the market value of wolf pelts and was instrumental in increasing the harvest. The trappers who administered this program were against implementing the nonlethal wolf control program, believing the trapping program could cause desired herd growth. When the nonlethal wolf control program was adopted by the Board of Game in spring 1997, the group ended their trapping program, and in addition, one of the primary fur buyers in the Interior decided not to purchase wolves trapped in Unit 20E. These actions were the primary causes for reduced wolf harvest during RY97 and RY98. Even though trappers ended the privately funded Fortymile Caribou Calf Protection Program when the nonlethal wolf control plan was approved, the Fortymile caribou recovery program benefited from their participation. Wolf harvest has remained low because of low prices and declining trapper interest.

Trappers continued to use snares and traps as the primary methods to catch wolves in Unit 20E (Table 2). During RY99–RY01, 2–4 wolves were taken by hunters incidental to moose or caribou hunts during the fall hunting season.

Harvest Chronology. During RY99–RY01, the average percent wolf harvest during August and September (wolf hunting only), November through March (snaring, trapping, and hunting), and October and April (snaring only) was 7%, 79%, and 14%, respectively (Table 3). During the report period and historically, most harvest occurred during December through February. During the 2 years of the privately funded Fortymile Caribou Calf Protection Plan, trappers who shifted their lines to western Unit 20E did so during February, resulting in most of the additional harvest occurring during February–April.

Transport Methods. Most successful wolf trappers used snowmachines in Unit 20E (Table 4). Airplanes were used by a small number of trappers to access areas not trapped by land-based trappers. The number of wolves caught by trappers using airplanes for transportation was primarily dependent on market price for wolves, lynx, and marten. During years of high marten or lynx prices, these trappers reduced their wolf trapping efforts unless wolf pelt prices were also high. During RY99–RY01, trappers using airplanes for access were responsible for 20–35% ($\bar{x}$ = 27%) of the harvest, the highest 3-year average since 1988. This harvest was mostly by several trappers who attempted to reduce wolf packs that ranged within the Fortymile caribou herd's calving grounds and commonly killed calves but had not been reduced by nonlethal wolf control. Most wolves taken by trappers using highway vehicles were taken along the southern half of the Taylor Highway between Chicken and the Alaska Highway.

HABITAT

Assessment

Prey availability dictates wolf habitat use, therefore, preferred wolf habitat occurs with a greater ungulate prey base. Because of the migratory behavior of caribou and their fidelity to calving grounds, high densities of caribou are available seasonally to certain wolf packs. The Fortymile

Herd has increase over 100% since 1995 and in summer 2002, numbered about 46,000 caribou. The Fortymile Herd spends 8–10 months in Unit 20E. Since winter 1997, the Nelchina and Mentasta caribou have primarily wintered in Unit 20E adding 5000–40,000 caribou into the unit. Almost all Unit 20E wolf packs have thousands of caribou available throughout the winter. Between May and October, only the Fortymile Herd is in Unit 20E, and it is concentrated in certain areas. During this period, most packs must rely on moose or small mammals as their primary prey. Snowshoe hare densities were high during 1998–spring 2001 but crashed to very low levels in spring 2001. Moose densities in Unit 20E are low (0.2–0.7 moose/mi^2, $\bar{x}$ = 0.46 moose/mi^2) (Gardner 2002). Based on prey availability, wolf habitat currently is moderate, but the habitat could support higher populations of prey and wolves if environmental conditions or management actions allowed the moose population to increase substantially.

Human development is not currently a problem for wolves in the area. Habitat quality for ungulates is currently not a limiting factor for any ungulate prey species.

Enhancement

Since the early 1970s, the Upper Tanana–Fortymile ecosystem has contained relatively low density wolf and ungulate populations. To enhance the Fortymile caribou herd, nonlethal wolf control was implemented in November 1997. To enhance the moose population, 3 different prescribed burns during 1998 and 1999 were ignited and burned 95,000 acres. Also, Unit 20E is included in the Alaska Interagency Fire Management Plan. At least 60% of the area is classified in limited suppression status, which should assure a near-natural wildfire regime. This, in turn, should increase habitat diversity that will benefit wolf prey species.

NONREGULATORY MANAGEMENT PROBLEM/NEEDS

Nonlethal wolf control was conducted during November 1997–May 2001. A brief description of the preliminary results follows.

Wolf Reduction

We used a combination of nonlethal wolf relocation and public wolf trapping to reduce wolf numbers by 78% within 15 pack territories. To ensure minimum return, wolves older than 11 months were moved ≥200 miles. Mortality rates for relocated wolves ranged between 50–60%, which is similar to naturally dispersing wolves (Peterson et al. 1984; Ballard et al. 1997). Trapping was the primary cause of mortality. It appears that moving subordinate wolves will not increase their mortality if they are moved at the age when most wolves naturally disperse to areas that support prey densities as high as or higher than the original territory.

The 15 pack territories were maintained at 2 wolves/pack by sterilizing the alpha wolves. The sterilized wolves have maintained their territories for 2–5 years, and as of June 2003 wolf numbers in 10 of the 15 pack territories were still limited due to the presence of 1–2 sterilized wolves. The program effects will continue as long as these wolves restrict productivity. Wolf sterilization appears to be a viable technique to maintain wolf packs at desired levels.

Comparing wolf treatment years (RY97–RY00) to pretreatment years when the Fortymile caribou herd was stable (RY90–RY95), adult caribou survival significantly increased (P = 0.02) and May–July calf mortality due to wolves significantly declined (P = 0.02). The herd increased an average >10%/year during 1998 and 2002. Wolf predation continues to be the primary cause of mortality for Fortymile caribou. The 15 packs encompassed most but not all of the herd's calving and summer range and the herd travels through territories of an additional 25–30 packs during the remainder of the year.

The wolf and caribou data will be analyzed more completely and published in future research and management reports and journals. A more conclusive analysis of the effect of reducing wolves in only a portion of the herd's range on herd trend relative to other factors will be included.

Wolf–Moose Relationships

The moose population in Unit 20E exists at low density and is limited by grizzly bear and wolf predation (Gasaway et al. 1992). During RY01, Gardner (2002) estimated the Unit 20E moose population was declining slowly. In most of Unit 20E, wolf numbers are increasing. Based on observations of radiocollared packs, it appears that caribou have become the primary prey for most wolves in Unit 20E during the winter (J Burch, NPS, personal communication; R Boertje, ADF&G, unpublished data). However in most areas, caribou are unavailable during the summer and wolves must shift their diet to moose and small mammals. Seip (1992) has shown how wolf predation can have large effects on ungulate populations when wolf populations benefit from alternate prey. In Unit 20E, wolf numbers have increased due to a combination of increasing caribou, high snowshoe hare numbers, and low harvest. Moose calf:cow ratios have declined since 1998 and yearling bull:cow ratios since 2000 (Gardner 2002) coincident with increasing wolf numbers.

I used McNay and DeLong's (1998) PredPrey model to estimate the effects of wolves on the Unit 20E moose population during the next 3 years (RY02–RY05). I assumed that caribou would remain the primary prey for wolves during the winter and grizzly bears will remain the primary predator on moose calves. Based on this exercise, the following scenario seems likely: 1) if wolf harvest rates remains low (20%), wolf numbers will increase; 2) caribou numbers will continue to increase; 3) moose numbers will continue to decline slowly if wolf numbers stay constant at RY02 levels; and 4) moose numbers will decline 2–3% faster per year if wolf numbers increase as projected.

The moose population in Unit 20E exists at low density but can decline further due to increasing predation effects by wolves. Increasing numbers of caribou has increased the complexity of this system and it appears there is no easy answer for moose–caribou–wolf–grizzly bear management in Unit 20E. It is likely that moose numbers and bull:cow ratios will decline to unacceptable levels within 5–7 years unless wolf and grizzly bear predation effects are lessened. This area may offer an excellent opportunity to study the effects of wolf predation on low density moose when a rapidly expanding caribou population is the primary prey.

CONCLUSIONS AND RECOMMENDATIONS

The wolf population in most of Unit 20E increased during RY99–RY02 due to expanding caribou numbers and range use, high numbers of snowshoe hares and limited trapping pressure. Nonlethal wolf control ended in May 2001. In combination with public trapping, wolf numbers in 8 Unit 20E pack territories were reduced by 78%. By RY02, wolf numbers in 4 of those territories were recovering.

The effects of nonlethal wolf control on Fortymile caribou population trend is still being analyzed. Preliminary indications are that reduced wolf numbers benefited adult and summer calf survival. The herd increased 5–14% annually following wolf reduction.

Wolf harvest has been below sustainable levels since RY95 due to reduced fur prices and trapper interest. Trappers continued to be important contributors to the Fortymile caribou recovery effort because they selected for wolf packs that were not reduced by nonlethal wolf control but were significant predators on caribou calves.

All of the work activities were completed during this report period. More travelers use the Taylor Highway to see wildlife and the number of reported wolf sightings has increased. Wolf hunting and trapping seasons were long and met consumptive needs. Status of the wolf population in Unit 20E, the effects of the nonlethal wolf control program, and trends of moose, caribou, and Dall sheep in relation to wolf predation are presented 1–2 times/year in "The Comeback Trail" a newsletter sent to over 5000 people in Alaska and Canada. Management objectives will be formulated during the next reporting period.

Wolf predation on moose may become more of an influence on moose population trends. Modeling data indicates that wolf predation may become increasingly important in perpetuating a decline in the unit's moose population, if projected increases in wolf numbers occur as the result of increasing caribou numbers. The predator–prey relationships in Unit 20E are becoming more complex due to a rapidly increasing caribou herd, which is allowing wolf numbers to increase.

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TABLE 1 Unit 20E fall wolf population estimates[a], regulatory years 1988–1989 through 2002–2003[b]

Regulatory year	Population estimate[c]	Number of packs	Mean pack size[d]		Basis of estimate
1988–1989	173	32	4.9		Aerial survey, observations, reports
1989–1990	205	33	5.6		Aerial survey, observations, reports
1990–1991	231	33	6.3		Aerial survey, observations, reports
1991–1992	169–184	31	5.1		Aerial survey, observations, reports, radio collars
1992–1993	194–214	32	5.7		Aerial survey, observations, reports, radio collars
1993–1994	200–224	34	5.7		Aerial survey, observations, reports, radio collars
1994–1995	192–204	34	5.3		Aerial survey, observations, reports, radio collars
1995–1996	227–238	34	6.2		Aerial survey, observations, reports, radio collars
1996–1997	220–230	34	6.0		Aerial survey, observations, reports, radio collars
1997–1998	221–236	34	6.0		Aerial survey, observations, reports, radio collars
1998–1999	195–225	34	5.6	(6.2)[e]	Aerial survey, observations, reports, radio collars
2002–2003	245–260	34	7.4	(7.8)	Aerial survey, observations, reports, radio collars

[a] Fall estimate = pretrapping season population.

[b] No unitwide surveys were conducted during RY99–RY01, therefore no estimates were done.

[c] Includes 10% estimated number of single wolves present.

[d] Calculated using mean population estimate × 0.9 divided by number of packs.

[e] In parentheses is mean pack size for all packs not affected by the nonlethal wolf control program.

TABLE 2 Unit 20E wolf harvest, regulatory years 1988–1989 through 2001–2002

Regulatory year	Reported harvest						Method of take				Successful	
	M	(%)	F	(%)	Total[a]	% Autumn population[b]	Trap or snare (%)	Shot (%)	SDA[c] (%)	Unk	Trappers and hunters	Wolves/ person
1988–1989	2	(22)	7	(78)	9	5	7 (78)	2 (22)		6	6	1.5
1989–1990	7	(54)	6	(46)	15	7	12 (80)	3 (20)		10	10	1.5
1990–1991	15	(63)	9	(37)	24	10	12 (52)	5 (22)	6 (26)	1	13	1.8
1991–1992	13	(68)	6	(32)	19	11	14 (77)	1 (5)	3 (17)	1	10	1.9
1992–1993	28	(49)	28	(49)	57	28	52 (95)	3 (5)	0 (0)	2	21	2.7
1993–1994	34	(57)	26	(43)	68	32	55 (90)	6 (10)	0 (0)	7	21	3.2
1994–1995	24	(63)	14	(37)	39	20	29 (74)	8 (21)	2 (5)	0	16	2.4
1995–1996	37	(51)	39	(49)	84	37	80 (95)	3 (4)	1 (1)	0	18	4.6
1996–1997	24	(44)	23	(43)	54	24	48 (89)	6 (11)		0	15	3.6
1997–1998	16	(44)	20	(56)	36[d]	16	32 (89)	3 (8)		0	10	3.5
1998–1999	9	(53)	6	(35)	17	8	12 (71)	5 (29)		0	9	1.9
1999–2000	18	(58)	11	(35)	31	–[e]	27 (96)	1 (4)		3	21	1.5
2000–2001	27	(54)	20	(40)	50	–[e]	44 (88)	6 (12)		0	12	4.2
2001–2002	20	(63)	11	(34)	32	–[e]	29 (91)	3 (9)		0	10	3.1

[a] Total harvest includes animals of undetermined sex.

[b] Proportion of the estimated fall population harvested by the end of the season in Apr. If a range was given for the fall estimate, the proportion taken is given as the harvest divided by the mean estimate.

[c] SDA taking prohibited during regulatory years 1988 and 1989 and beginning in regulatory year 1997.

[d] One wolf was accidentally killed during a capture operation; it was only included in the total take.

[e] Population was not estimated, therefore percent autumn population was not calculated.

TABLE 3 Unit 20E wolf harvest chronology, regulatory years 1988–1989 through 2001–2002

Regulatory year	Harvest periods																	
	Aug	(%)	Sep	(%)	Oct	(%)	Nov	(%)	Dec	(%)	Jan	(%)	Feb	(%)	Mar	(%)	Apr	(%)	n[a]
1988–1989	0	(0)	1	(11)	0	(0)	0	(0)	2	(22)	2	(22)	3	(33)	1	(11)	0	(0)	9
1989–1990	0	(0)	2	(13)	1	(7)	2	(13)	3	(20)	6	(40)	1	(7)	0	(0)	0	(0)	15
1990–1991	3	(15)	2	(10)	0	(0)	0	(0)	2	(10)	4	(20)	3	(15)	2	(10)	4	(20)	24
1991–1992	0	(0)	1	(6)	1	(6)	2	(11)	4	(22)	4	(22)	5	(28)	1	(6)	0	(0)	19
1992–1993	0	(0)	3	(5)	1	(2)	1	(2)	6	(11)	13	(23)	18	(32)	10	(18)	5	(9)	57
1993–1994	2	(3)	3	(5)	4	(6)	8	(13)	18	(29)	8	(13)	12	(19)	6	(10)	1	(2)	68
1994–1995	3	(8)	2	(5)	3	(8)	3	(8)	7	(18)	5	(13)	9	(23)	7	(18)	0	(0)	39
1995–1996	1	(1)	1	(1)	4	(5)	12	(14)	11	(13)	10	(12)	24	(29)	15	(18)	5	(6)	84
1996–1997	0	(0)	4	(7)	0	(0)	1	(2)	15	(28)	14	(26)	4	(7)	13	(24)	3	(6)	54
1997–1998	0	(0)	2	(6)	0	(0)	3	(8)	8	(22)	14	(39)	3	(8)	5	(14)	0	(0)	36
1998–1999	0	(0)	4	(24)	0	(0)	0	(0)	2	(12)	4	(24)	3	(18)	4	(24)	0	(0)	17
1999–2000	0	(0)	2	(6)	0	(0)	1	(3)	5	(16)	7	(23)	5	(16)	0	(0)	11	(35)	31
2000–2001	0	(0)	4	(8)	0	(0)	2	(4)	7	(14)	13	(26)	15	(30)	5	(10)	4	(8)	50
2001–2002	0	(0)	2	(6)	0	(0)	2	(6)	12	(38)	6	(19)	6	(19)	4	(13)	0	(0)	32

[a] Total includes wolves for which date of take was unknown.

TABLE 4 Unit 20E wolf harvest by transport method, regulatory years 1988–1989 through 2001–2002[a]

Regulatory year	Harvest by transport method								
	Airplane (%)	Dogsled, skis, or snowshoes (%)	Boat (%)	3- or 4-Wheeler (%)	Snowmachine (%)	ORV (%)	Highway vehicle (%)	Unk	*n*
1988–1989	1 (11)	1 (11)	0 (0)	1 (11)	6 (67)	0 (0)	0 (0)	0	9
1989–1990	1 (7)	5 (33)	0 (0)	0 (0)	7 (47)	1 (7)	1 (7)	0	15
1990–1991	8 (33)	1 (4)	0 (0)	2 (9)	10 (43)	0 (0)	2 (9)	1	24
1991–1992	4 (24)	1 (6)	0 (0)	1 (6)	10 (59)	0 (0)	1 (6)	2	19
1992–1993	6 (11)	6 (11)	0 (0)	0 (0)	41 (72)	0 (0)	4 (7)	0	57
1993–1994	16 (24)	0 (0)	0 (0)	1 (1)	31 (46)	0 (0)	19 (28)	1	68
1994–1995	14 (36)	0 (0)	0 (0)	0 (0)	23 (59)	0 (0)	2 (5)	0	39
1995–1996	11 (13)	3 (4)	0 (0)	1 (1)	67 (80)	0 (0)	2 (2)	0	84
1996–1997	5 (9)	0 (0)	1 (2)	1 (2)	43 (83)	1 (2)	1 (2)	2	54
1997–1998	1 (3)	0 (0)	0 (0)	1 (3)	22 (61)	0 (0)	11 (31)	0	35
1998–1999	2 (12)	0 (0)	0 (0)	1 (6)	6 (35)	0 (0)	8 (47)	0	17
1999–2000	11 (35)	0 (0)	0 (0)	0 (0)	18 (58)	0 (0)	2 (6)	0	31
2000–2001	10 (20)	1 (2)	0 (0)	1 (2)	30 (60)	0 (0)	8 (16)	0	50
2001–2002	8 (25)	0 (0)	0 (0)	1 (3)	21 (66)	0 (0)	2 (6)	0	32

[a] Unknown transport not used to calculate harvest percent.

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNITS: 21B, 21C, 21D (20,655 mi^2)

GEOGRAPHIC DESCRIPTION: Yukon River drainage above Paimiut to Tozitna River, including Koyukuk River up to Dulbi Slough

BACKGROUND

Wolves were present when humans first settled the area and are an important part of the local culture. They occur throughout Unit 21 in all habitat types, even near human settlements. Wolf populations fluctuate depending upon the availability of prey and harvest by humans.

Unit 21D and the lowlands of Unit 21B have more wolves than Unit 21C. Prior to 1945, moose were uncommon and caribou numbers fluctuated in Unit 21D. Moose rapidly increased in the 1940s and 1950s coincident with federal wolf control. In the mid 1950s, moose densities were thought to be similar to current estimates (3–9 moose/mi^2) in the Koyukuk lowlands near Three-day Slough. Subsequently, wolf numbers increased as a result of the increase in the number of moose and the end of federal wolf control of the mid 1950s. Wolf populations in Units 21B and 21C may be lower than in the early 1900s because moose densities are now lower.

Each year many wolf pelts taken for personal use are not sealed; therefore, actual harvest is moderately higher than reported on sealing certificates or on export and acquisition documents. Personal use includes making wolf parka ruffs that local families present to others as gifts at traditional potlatches. Additionally, many local residents make a conscious effort to increase their wolf harvest when moose are scarce because they feel wolves are competitors for moose meat.

MANAGEMENT DIRECTION

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Management may include manipulation of wolf population size or total protection of wolves from human influence. Not all human uses will be allowed in all areas or at all times; management will focus on providing sustained, diverse human uses of wolf populations.

MANAGEMENT GOALS

- Ensure long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.
- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and reflect the public's interest.
- Increase public awareness and understanding of uses, conservation and management of wolves, their prey, and habitat in Alaska.

MANAGEMENT OBJECTIVES

- Maintain a fall density of 18–23 wolves/1000 mi^2 (7–9 wolves/1000 km^2).
- Provide for a total annual harvest of 85–105 wolves.
- Increase trapper participation in statewide trapper survey by at least 1% annually.

MANAGEMENT ACTIVITIES

- Conduct surveys to estimate population size and density.
- Model the potential effects of wolf predation on ungulates in each unit.
- Monitor harvest through sealing records and trapper questionnaires.
- Monitor wolf numbers and population characteristics through interviews with trappers, hunters, pilots, and by evaluation of sealing documents.
- Conduct trapper education clinics.

METHODS

We worked cooperatively with the US Fish and Wildlife Service (FWS) to estimate the late winter wolf population and pack size using aerial surveys. In February 1994, a Sample Unit Probability Estimator (SUPE) survey (Becker et al. 1998) was conducted in Unit 21D. The unit was divided into 760 sample units of 16 mi^2 each, and each sample unit was classified into 1 of 3 density strata; high, medium, or low. SUPE surveys were also conducted during March 1996 in Unit 21B and during March 2000 primarily in Unit 24, but along the common boundary with Unit 21D.

Wolf reconnaissance surveys were flown in the northern portion of Unit 21D in March 1999 and in Unit 21B in April 2001, using SUPE methodology. However, we were unable to satisfy assumptions required for application of the technique because of poor snow conditions. Therefore, a minimum estimate for the area was developed from the data (ADF&G files, Galena, 7 May 1999; 26 April 2001).

Fall wolf population and pack size was estimated for Unit 21D by adding overwinter mortality (26%, Spindler 1992) and hunting mortality to the late winter population estimates. Late winter estimates and fall population estimates were the same in Units 21B and 21C because no overwinter mortality data was available and harvest was relatively small in those subunits. Population data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY00 = 1 Jul 2000 through 30 Jun 2001).

Wolves harvested by trappers and hunters were sealed to monitor harvest. Information recorded for each wolf included date of kill, name of trapper or hunter, location of kill, method of take and transportation, sex of the wolf, color of the pelt, and the number of other wolves thought to be in the pack. Trapper interviews were also used to monitor harvest. Data were summarized by regulatory year.

We conducted wolf snaring and trapper education courses during RY99–RY02 in local villages to improve trapper skills and knowledge of wildlife management issues.

Beginning in 1986, 50 wolves were radiocollared in 25 packs on the Koyukuk National Wildlife Refuge (NWR) and the Nowitna NWR. Wolves were collared at Dalki River, Upper Dulbi River, Lower Dulbi River, Nayuka River, Nowitna River mouth, Monzonite Hills, Ham Island, Three-day Slough, Bishop Rock, Happy Slough, Bonanza Creek, North Creek and Bear Creek.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Wolf population estimates increased during RY98–RY00 but stabilized by RY01 (Table 1). Some of the increase can be attributed to better survey information and extrapolation of density estimates from surveyed areas to unsurveyed areas.

We completed a SUPE survey in Unit 21D (12,113 mi^2) during 8–16 March 1994. Of 760 sample units, 66.6% of the high (n = 144), 33% of the medium (n = 259), and 14% of the low (n = 357) were flown and searched for wolf tracks. We observed 173 wolves (or distinct tracks). The estimated unit population was 220–292 ($\bar{x}$ = 256; 80% CI ± 14.2%) with a density of 18.1–24.3 wolves/1000 mi^2 (7.0–9.4 wolves/1000 km^2) ($\bar{x}$ = 21.2 wolves/1000 mi^2 or $\bar{x}$ = 8.2 wolves/1000 km^2). The number of single wolves was 6.5% of the total. We also estimated 49.3 ± 6.1 packs (Becker et al. 1998).

We completed an aerial reconnaissance survey during March 1999 in the northern portion of Unit 21D. Eighty-seven wolves were seen, along with distinct tracks of 39 additional wolves, indicating 126 wolves in 20 packs with a density of 32.1 wolves/1000 mi^2 (12.4 wolves/1000 km^2). We also completed a SUPE survey in adjacent Unit 24 during March 2000 that included part of the area surveyed during 1999 in Unit 21D. In the Unit 24 survey, the population estimate was 147.8 wolves (± 32.2; 90% CI) over a 4175-mi^2 survey area for a density of 35.5 wolves/1000 mi^2 (13.7 wolves/1000 km^2). Using data from both Unit 21D and

Unit 24, I estimated the late winter 2000 wolf population in all of Unit 21D was 309–445 wolves ($\bar{x}$ = 377) in 37–55 packs (9.8–14.2 wolves/1000 km^2).

We completed a SUPE survey in Unit 21B (4871 mi^2) during 15–17 March 1996 to estimate the size of the wolf population. Of the 307 sample units, 59% of the high, 30% of the medium, and 15% of the low stratum were flown and searched for tracks. The estimate was 56–80 wolves ($\bar{x}$ = 68; 80% CI ± 17.8%), with a density of 11.4–17.4 wolves/1000 mi^2 (4.4–6.7 wolves/1000 km^2; $\bar{x}$ = 5.4).

We conducted a reconnaissance survey in Unit 21B (4871 mi^2) during 13–14 April 2001, but conditions were poor for tracking wolves (ADF&G files, Galena, 26 April 2001). There were 7 wolves observed during that survey with an additional 40 wolves identified by distinct tracks (minimum estimate of 11 packs). Location of tracks and pack size was similar to pack locations from previous surveys, which provided confidence in our estimates. Minimum pack density was estimated to be 9.6 wolves/1000 mi^2 (3.7 wolves/1000 km^2) for the 12,616-km^2 survey area. Using the annual growth rate of 3.4% observed in Unit 21D, data from the 1996 SUPE survey, and the 2001 information, I estimated the Unit 21B population was stable at 56–96 wolves ($\bar{x}$ = 76 wolves) in 9–15 packs.

Unit 21C was not surveyed. During the previous reporting period, the fall density was 12.9–18.1 wolves/1000 mi^2 (5–7 wolves/1000 km^2) (Woolington 1997). Based on this information, I estimated the Unit 21C late winter population was 48–66 wolves in 6–10 packs.

The total population during fall in all 3 subunits likely increased during RY99–RY00 and stabilized in RY01. Using all data sources, estimates were 427–746, 442–771, and 442–771 wolves during RY99, RY00 and RY01, respectively (Table 1). The estimated number of packs during those regulatory years was unchanged at 52–80 packs.

Distribution and Movements

In 1994 on the Kaiyuh Flats, the density was 28.5 wolves/1000 mi^2 (11 wolves/1000 km^2); on the Koyukuk lowlands north of Galena (including Three-day Slough) the density was 20.7 wolves/1000 mi^2 (8 wolves/1000 km^2); and in the Nowitna drainage the density was 18.1 wolves/1000 mi^2 (7 wolves/1000 km^2) (Spindler 1992).

Telemetry data from previous studies showed that most packs within Unit 21 occupied territories of 250–500 mi^2 (Katnik 1997). Some packs vacated their initial home ranges and moved to adjacent areas, but they were not followed long enough to see if they returned to their initial ranges. Several wolves that were pack members or were alone when collared, moved large distances during the study. One wolf moved south 40 miles and then returned north.

Katnik (1997) evaluated wolf distribution with respect to moose distribution and riparian habitat. Not surprisingly, he found that wolf packs spent disproportionately greater time in both riparian and nonriparian area that had high moose densities. Additionally, they spent disproportionately less time in nonriparian areas with medium or low moose densities. However, wolf packs did not necessarily spend more time in the high-density moose areas of

their established territories (Katnik and Spindler 1998), possibly because of required movements to maintain territory boundaries. Rivers and small drainages apparently provided important travel routes throughout wolf territories, but low sample sizes precluded definitive evaluation of wolf distribution relative to habitat.

MORTALITY

Harvest

Seasons and Bag Limits.

Units and Bag Limits	Resident Open Seasons	Nonresident Open Seasons
Units 21B, 21C, and 21D		
Hunting: 5 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
Trapping: No limit.	1 Nov–30 Apr	1 Nov–30 Apr

Alaska Board of Game Actions and Emergency Orders. In RY94 the board continued the ban on same-day airborne hunting but allowed taking wolves the same-day airborne under trapping regulations if the trapper moved 300 ft from the aircraft before taking a free-ranging wolf. Beginning in RY97 this provision of same-day airborne harvest was eliminated in the trapping regulations as well. Beginning RY95 the trapping season was extended through April. No changes were adopted during the reporting period.

Hunter/Trapper Harvest. Hunters and trappers reported harvesting 54, 87, and 75 wolves during RY99, RY00, and RY01, respectively (Table 2). Most of the wolves were taken in Unit 21D. The actual number harvested was higher because some village residents seal only those wolf pelts that are sent to a commercial tannery or sold to a fur buyer. For most years, this unreported harvest probably averaged 20 wolves/year. Information gathered through personal interviews improved our estimate of the number of unreported wolves that were harvested in RY00 and RY01.

In RY99–RY02, ADF&G sponsored wolf-snaring clinics in the villages of Galena, Ruby, Kaltag, Nulato, and Huslia. Snaring techniques, snare building instruction, leghold trapping techniques and fur handling were presented. Supplies were available for snare construction, and participants built and took home wolf snares. Participants were sent follow-up mailings regarding sources of trapping and snaring supplies. They were also registered for the statewide trapper questionnaire.

Harvest Chronology. Most wolves were harvested in January, February, and March during RY99–RY01 (Table 3). Increased sightings and incidental harvest during the fall moose hunting seasons was probably due to higher wolf densities.

Transport Methods. Most wolves were taken using snowmachines for transportation during RY99–RY01 (Table 4).

CONCLUSIONS AND RECOMMENDATIONS

Overall the wolf population in the reporting area increased during RY99–RY00. However, wolf population trends varied in different subunits. Densities probably were unchanged in Units 21B and 21C during the reporting period, but continued to increase in Unit 21D through RY00. By RY01 the number of wolves in Unit 21D apparently stabilized due to a declining prey base and increased harvest.

Total harvest in all 3 subunits during the reporting period averaged 105 wolves/year, an estimated 14–24% of the autumn population. Because moose are the primary prey for wolves in this area, a reduction in their numbers will subsequently cause a decline in wolves. Moose numbers declined during RY99–RY01 throughout the reporting area, and combined with apparent increased hunting pressure on wolves it appeared that the number of wolves had stabilized in this area.

The first management objective, to maintain a fall density of 18–23 wolves/1000 mi^2 (7–9 wolves/1000 km^2), was probably not met during the reporting period. The fall estimate for the area (20.7–37.3 wolves/1000 mi^2; 8.0–14.4 wolves/1000 km^2) indicated the population was high relative to the objective. Activities to promote increased hunting and trapping pressure should continue to be a priority in order to achieve this objective. The second objective, to provide for a total annual harvest of 85–105 wolves, was met because the population provided for a harvest of at least 128 wolves in RY99 and 155 wolves in RY00–RY01. In RY99–RY00, the third objective, to increase trapper participation in statewide trapper survey by at least 1% annually, was achieved with an increase in participation in the Trapper Questionnaire of 100% in RY99 and an additional 19% in RY00; however, response declined in RY01 by 26%.

All management activities were accomplished during RY99–RY01. Harvest monitoring was an important part of the wolf management program. It included the statewide sealing system, trapper questionnaires, and trapper interviews. Trapper education courses were effectively utilized. Finally, although a definitive model of wolf predation dynamics was not fully completed, we applied the PredPrey computer model (McNay and DeLong 1998) in several scenarios. Work with the PredPrey model will be continued.

I recommend continued trapper education programs to improve harvest reporting and to increase trapper skills, ethics, and knowledge. I also recommend more radiotelemetry studies and continued spring population estimation surveys to improve our understanding of wolf populations. Within the Koyukuk–Nowitna NWR in Units 21B and 21D, radiotelemetry studies have improved wolf population estimates and increased our information about wolf predation on moose.

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TABLE 1 Units 21B, 21C, and 21D fall wolf population estimates[a,b], regulatory years 1988–1989 through 2001–2002

Regulatory year	Population estimate	Number of packs
1988–1989	305–330	42–52
1989–1990	295–340	40–55
1990–1991	295–335	54–58
1991–1992	285–340	50–53
1992–1993	295–365	50–53
1993–1994	395–505	49–57
1994–1995	339–432	49–57
1995–1996	311–425	52–62
1996–1997	345–524	52–68
1997–1998	379–623	52–74
1998–1999	413–722	52–80
1999–2000	427–746	52–80
2000–2001	442–771	52–80
2001–2002	442–771	52–80

[a] Fall estimate = pretrapping season population.

[b] Based on Alaska Department of Fish and Game/US Fish and Wildlife Service sample unit probability estimator surveys, wolf reconnaissance aerial surveys, hunter/trapper reports, sealing records, incidental observations and assumed density of 12.9–18.1 wolves/1000 mi^2 (5–7 wolves/1000 km^2 in unsurveyed areas).

TABLE 2 Units 21B, 21C, 21D wolf harvest, regulatory years 1988–1989 through 2001–2002

Regulatory year	Reported harvest				Estimated unreported harvest	Total estimated harvest	Method of take			
	M	F	Unk	Total			Trap/snare	Shot	SDA[a]	Unk
1988–1989	5	6	0	11	20	31	3	2	5	1
1989–1990	14	15	0	29	20	49	7	3	19	0
1990–1991	14	4	3	21	20	41	9	12	0	0
1991–1992	22	14	4	40	20	60	19	18	1	2
1992–1993	20	11	4	35	20	55	15	16	0	4
1993–1994	31	23	1	55	20	75	38	16	0	1
1994–1995	17	11	7	35	20	55	11	18	6	0
1995–1996	16	28	3	47	20	67	29	18	0	0
1996–1997	16	18	2	36	20	56	27	9	0	0
1997–1998	12	19	0	31	20	51	19	12	0	0
1998–1999	38	21	1	60	20	80	35	25	0	0
1999–2000	31	23	0	54	20	74	30	24	0	0
2000–2001	55	32	0	87	35	122	53	31	0	3
2001–2002	25	29	21	75	25	100	38	26	0	11

[a] Wolves taken by hunters the same day they were airborne. In regulatory years 1994–1995 through 1996–1997 this includes wolves taken by trappers using aircraft for transportation.

TABLE 3 Units 21B, 21C, and 21D wolf harvest chronology percent by time period, regulatory years 1991–1992 through 2001–2002

Regulatory year	Harvest periods							
	Aug–Oct	Nov	Dec	Jan	Feb	Mar	Apr	*n*[a]
1991–1992	2	2	9	18	45	23	0	44
1992–1993	2	0	0	14	24	57	2	49
1993–1994	2	0	29	23	29	17	0	52
1994–1995	8	14	6	8	17	44	3	36
1995–1996	6	3	9	17	11	43	11	35
1996–1997	9	18	9	15	24	26	0	36
1997–1998	21	3	7	17	28	24	0	29
1998–1999	14	9	12	14	29	21	5	58
1999–2000	19	2	26	2	33	15	4	54
2000–2001	10	0	6	21	15	31	16	86
2001–2002	18	4	13	11	16	36	4	56

[a] Includes harvest from records received after total harvest was calculated.

TABLE 4 Units 21B, 21C, 21D wolf harvest percent by transport method, regulatory years 1991–1992 through 2001–2002

Regulatory year	Harvest percent by transport method								
	Airplane	Dogsled, Skis, Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unk	*n*[a]
1991–1992	41	32	11	2	2	0	0	11	44
1992–1993	6	0	0	0	86	0	0	8	49
1993–1994	0	2	2	0	88	0	0	8	52
1994–1995	19	3	5	0	49	0	0	24	37
1995–1996	0	3	6	0	91	0	0	0	35
1996–1997	0	3	6	0	88	0	3	3	34
1997–1998	0	19	16	0	61	0	0	3	31
1998–1999	2	2	10	0	85	0	0	2	60
1999–2000	19	4	9	0	69	0	0	0	54
2000–2001	3	0	9	1	85	0	0	1	87
2001–2002	17	1	9	0	72	0	0	0	75

[a] Includes harvest from records received after total harvest was calculated.

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNIT: 22 (25,230 mi^2)

GEOGRAPHIC DESCRIPTION: Seward Peninsula and the adjacent mainland drained by all streams flowing into Norton Sound.

BACKGROUND

Wolves were scarce throughout Unit 22 for much of this century. From the late 1890s, when reindeer herding was introduced to the Seward Peninsula until statehood in 1959, wolf numbers were actively suppressed by predator control programs and bounties intended to protect reindeer. In the 1960s, after government-sponsored predator control ended, wolf numbers in Unit 22 gradually increased and wolves expanded their range westward across the Seward Peninsula (Pegau 1971 and Grauvogel 1979). By 1980, wolf sign was reported in all major drainages in Unit 22, but reported sightings were generally of individual animals or small groups of 2 to 3 wolves. During this time period the Unit 22 wolf population was estimated at fewer than 100 wolves (Grauvogel 1980). From 1980 until 1996 wolf numbers and pack sizes increased and were most abundant in Units 22A and 22B where caribou from the Western Arctic Caribou Herd (WAH) wintered. WAH expanded its winter range westward in 1996, and wolves followed into areas of Units 22D and 22E.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Maintain viable wolf populations in Unit 22.
- Minimize adverse interactions between wolves and the public.

MANAGEMENT OBJECTIVES

- Maintain license vendors and fur sealers in all Unit 22 villages.
- Monitor wolf harvest through the fur sealing program, annual hunter/trapper questionnaires and big game harvest surveys conducted annually in selected Unit 22 villages.

- Improve compliance with current sealing requirements through public communication and education.

- Assess population status and trends utilizing sealing records, hunter/trapper interviews and questionnaires, village harvest surveys and observations by staff and the public.

- Cooperate with reindeer herders to evaluate methods for reducing adverse interactions between wolves and reindeer.

METHODS

Research has never been conducted in Unit 22 to assess wolf distribution and population trend. Estimates of wolf distribution, population trend, harvest, and human use data are annually obtained from sealing certificates and observations by staff, reindeer herders, and other local residents. Big game harvest surveys were conducted in seven villages (Table 3), and fur-harvest questionnaires were mailed to hunter/trappers annually during 1999–2002 (this reporting period) to collect additional information about wolf harvest and abundance in Unit 22.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We have no survey data or information to determine the wolf population in Unit 22. Wolf abundance depends on the presence of WAH in Unit 22, and increases during winter months (October–April) when caribou were present. Increasingly, wolves are becoming permanent residents of the unit.

Unit 22 participated in the statewide trapper survey program during the reporting period. Questionnaires were sent to hunter/trappers who harvested furs in Unit 22 to better assess harvest and abundance of wolves and other furbearers. Respondents throughout Unit 22 reported that wolves were common and numbers are increasing.

Population Composition

We have no survey data or information to determine the composition of the wolf population in Unit 22.

Distribution and Movements

Seasonal movements of WAH influence wolf abundance in Unit 22. Due to the occurrence of regular caribou winter range in eastern Unit 22, wolf abundance has historically been higher in Unit 22A and Unit 22B. However, during 1996–2002 caribou expanded their winter range westward into Units 22D and 22E, and wolf harvest and observations in those areas also increased (Table 2). The dispersal of wolves into Unit 22 has also been demonstrated by finding radiocollared wolves in Unit 22 that were originally collared in other areas of Alaska.

MORTALITY

Harvest

Season and Bag Limits. The season and bag limits were the same for all regulatory years in the reporting period.

1999-2000 to 2001-2002 Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 22		
Residents and Nonresidents:		
Trapping - no limit	1 Nov–30 Apr	1 Nov–30 Apr
Hunting – 5 wolves	10 Aug–30 Apr	10 Aug–30 Apr

Board of Game Actions and Emergency Orders. There were no Board of Game actions or emergency orders affecting wolf hunting or trapping in Unit 22 during the reporting period.

Hunter/Trapper Harvest. The annual reported harvest during the reporting period ranged from 32 to 63 wolves (Table 1). The high harvest in 1999–2000 resulted from wolf abundance due to wintering caribou, and good snow conditions in spring 2000 that allowed hunters and trappers long periods of access to wolves. Sex composition of the reported harvest during the 3-year reporting period was as follows: 55% males, 36% females, and 9% sex unknown (n = 157). As in previous years, the majority of wolves were harvested in Units 22A and 22B. Reported harvest during the reporting period in Unit 22A decreased by 24% and increased in Unit 22B by 140%. This change in harvest reflects the abundance of wintering WAH during the reporting period, which wintered in increasing numbers in Unit 22B, and in decreasing numbers in Unit 22A.

The magnitude of unreported wolf harvest each year in Unit 22 is thought to be substantial and fursealing data provides only a minimum estimate of harvest. Although fursealing agents are available in all Unit 22 villages, often hunter/trappers seal only those pelts that will be commercially tanned or sold to furbuyers. Many wolf hides are home tanned and used locally and people see no reason to seal them (Persons 2000). In May 1999, 2000, and 2001 village-based harvest surveys were completed in 7 villages in Unit 22 to obtain better harvest information on wolves and other big game species. Results from harvest assessment surveys revealed an additional 27 wolves harvested during 1999–2001 that had not been sealed (Table 3).

Permit Hunts. There were no permit hunts for wolves in Unit 22 during the reporting period.

Hunter Residency and Success. Sealing certificate data indicate that residents of Unit 22 harvested 94% of the wolves taken during the reporting period. Residents from Unit 22A and 22B harvested 76% (n=113) of the wolves; Alaska residents living outside of Unit 22 harvested 3 wolves, and nonresidents harvested 6 wolves.

Harvest Chronology. Wolf harvest in Unit 22 occurs primarily in the winter months when snow machines can be used for transportation, hides are prime, and wolves are most abundant

due to the presence of WAH. During this reporting period, 95% of the harvest occurred between November and April, 2% in September and 1% in October.

Harvest Methods. During the reporting period 80% (n=157) of the wolf harvest in Unit 22 was by subsistence or sport hunters, or done opportunistically by local residents while engaged in other activities. The few serious trappers in Unit 22 trapped or snared 8% of the wolves. The method of harvest for the remaining 12% is unknown (Table 1).

Transport Methods. Snowmachines were used 92% of the time by hunters/trappers during the reporting period. Individuals using airplanes, highway vehicles, boats and four-wheelers took 9 wolves during snow-free months.

Other Mortality

There were no observations of other mortality factors affecting wolves in Unit 22 during the reporting period.

HABITAT

Assessment and Enhancement

There were no habitat assessment activities or habitat enhancement projects for wolves in Unit 22 during the reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

There were no nonregulatory management issues to report related to wolves in Unit 22 during the reporting period.

CONCLUSIONS AND RECOMMENDATIONS

Quantitative data on wolf populations of Unit 22 are lacking. It would be beneficial to initiate wolf surveys in the unit to improve our understanding of wolf population dynamics and the effects of wolf predation on local ungulate populations of Unit 22.

Wolf densities are increasing throughout Unit 22. The expansion of WAH winter range on the Seward Peninsula is causing increased wolf abundance in Unit 22D and Unit 22E. If this trend continues, wolf predation may increasingly become a factor affecting moose management throughout Unit 22.

Public participation in the statewide Trapper Questionnaire program was valuable, providing impressions about abundance of wolves and other furbearers from numerous hunters/trappers throughout the unit (Persons 2000). Big game harvest surveys also proved to be an effective method of gathering more accurate harvest information from selected villages. The Harvest Assessment program should be continued, and expanding the program to include annual surveys in additional villages should be considered.

No changes in Unit 22 hunting or trapping regulations for wolves are recommended at this time. Future management projects should include collecting quantitative data on wolf

populations, and improving distribution of educational and informative materials that describe furbearer and wolf sealing requirements.

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Table 1 Reported Unit 22 wolf harvest for regulatory years 1988–1989 through 2001–2002

Regulatory	Reported harvest				Method of take			Total successful
	M	F	Unk.	Total	Trap / Snare	Shot	Unk.	Trapper / hunters
1988–1989	11	8	2	21	1	20	0	9
1989–1990	28	13	2	43	0	43	0	14
1990–1991	14	11	6	31	5	26	0	11
1991–1992	21	13	20	54	3	51	0	18
1992–1993	14	7	6	27	4	17	6	11
1993–1994	24	8	2	34	2	24	8	16
1994–1995	15	2	7	24	1	23	0	16
1995–1996	19	8	5	32	0	29	3	16
1996–1997	19	4	2	25	3	21	1	18
1997–1998	16	11	2	29	7	16	6	14
1998–1999	33	12	6	51	6	42	3	30
1999–2000	37	19	7	63	5	44	14	38
2000–2001	33	22	7	62	4	53	5	31
2001–2002	17	15	0	32	3	29	0	22

Table 2 Reported wolf harvest by unit, 1990–1991 through 2001-2002

Regulatory year	Harvest Unit 22A	Harvest Unit 22B	Harvest Unit 22C	Harvest Unit 22D	Harvest Unit 22E
1990–1991	21	8	0	2	0
1991–1992	43	9	0	2	0
1992–1993	13	11	2	1	0
1993–1994	23	11	0	0	0
1994–1995	13	9	2	0	0
1995–1996	15	16	1	0	0
1996–1997	15	10	0	0	0
1997–1998	19	9	1	0	0
1998–1999	25	18	2	2	4
1999–2000	18	32	0	3	10
2000–2001	22	33	0	7	0
2001–2002	5	24	2	1	0

Table 3 Wolf harvest by Unit 22 village residents, 1999-2000 and 2000-2001

Village	Harvest reported on village surveys	Nr. of wolves sealed	Percent of wolf harvest reported on sealing certificate	Timeframe of harvest asked on survey
Elim	13	2	15%	May 1999–April 2000
Shaktoolik	16	4	25%	May 1999–April 2000
White Mountain	4	3	75%	May 1999–April 2000
Teller	0	0	-	May 2000–April 2001
Brevig Mission	8	5	63%	May 2000–April 2001
Wales	0	0	-	May 2000–April 2001
Shishmaref	2	2	100%	May 2000–April 2001

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNIT: 23 (43,000 mi^2)

GEOGRAPHICAL DESCRIPTION: Western Brooks Range and Kotzebue Sound

BACKGROUND

Wolves are indigenous to northwest Alaska. Prior to statehood in 1959, bounties were paid for dead wolves and predator control programs were implemented to protect reindeer and caribou (McKnight 1973). After statehood, liberal hunting and trapping regulations that allowed aerial shooting and same-day-airborne hunting replaced government wolf control programs. High fur prices in the mid 1970s attracted nonlocal hunters to Unit 23 and stimulated local hunters and trappers to take wolves. As a result, wolf harvests were high when snow conditions were favorable for aircraft and snowmachines. During the 1980s, regulatory restrictions on aircraft and low fur prices reduced the harvest of wolves. Today, use of aircraft for hunting is prohibited throughout Unit 23. Local residents using snowmachines now harvest most wolves in Unit 23. Wolves are highly valued by consumptive and nonconsumptive users who live outside Unit 23. They are also highly valued by local residents as a source of fur for parka ruffs. Additionally, local hunters are accorded high esteem for taking wolves and wolverines. This is an important human social aspect of taking wolves that is insensitive to fur prices or the availability of wolves.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Management goals are to maintain viable populations of wolves in Unit 23, provide hunting and viewing opportunities, and minimize adverse interactions between wolves and people.

MANAGEMENT OBJECTIVES

Management objectives are to maintain the furbearer-sealing program and explore alternate harvest reporting systems.

METHODS

No quantitative wolf population data were collected during this reporting period. We collected incidental observations of wolves from staff and local residents. Additionally, the

statewide trapper questionnaire was mailed to a sample of unit residents. We estimated harvests from fur sealing certificates and community harvest assessments. Community assessments were conducted in Kiana (1999), Noatak (2 surveys: 1 each during 1999 and 2001–2002), Noorvik (2002), Selawik (1999) and Shungnak (1998–1999). The department (Division of Wildlife Conservation and Subsistence Division) and Maniilaq Association conducted the community harvest surveys (S. Georgette, pers. commun.).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Ballard (1993) estimated a density of 1 wolf/50 mi^2 (80% CI 37–74 mi^2) in the middle Kobuk River during May 1990 using a line-intercept track-sampling technique. Extrapolating this density to all of Unit 23 yields a population estimate of 869 wolves (80% CI, 580–1169). This unit-wide estimate should be viewed as a crude approximation of actual abundance.

Reports from local residents of Unit 23 and some commercial operators as well as my opportunistic observations indicate wolf numbers have increased in that portion of Unit 23 west of and including the Buckland River drainage. This is probably due to large numbers of caribou wintering in this area since 1996. Wolf numbers also seem to be higher in the upper Kobuk River drainage compared to before the mid 1990s (my observations as well as A. Williams and G. Bamford, pers. commun.). In contrast, wolf numbers appear to have declined somewhat in the upper Noatak River drainage since the late 1990s.

Population Composition

We have no survey data or information to determine the composition of the wolf population in Unit 23.

Distribution and Movements

Wolves occur throughout Unit 23. The movements and distribution of wolves are influenced by caribou, especially during the winter (Ballard 1993). During this reporting period significant numbers of caribou overwintered in the lower Noatak River drainage (2001–2002), upper Kobuk River (2002–2003) and on the Seward Peninsula (both regulatory years).

MORTALITY

Harvest

Season and Bag Limit. There were no changes to wolf hunting or trapping seasons or bag limits during this reporting period.

1999-2000, 2000-2001 and 2001-2002	Resident Open Season	Nonresident Open Season

Unit and Bag Limits	(Subsistence and General Hunts)	
Unit 23		
Residents and		
Nonresidents:		
Trapping – no limit	1 Nov–15 Apr	1 Nov–15 Apr
Hunting – 5 wolves	10 Aug–30 Apr	10 Aug–30 Apr

Board of Game Actions and Emergency Orders. In November 2001 the Board of Game increased the Unit 23 wolf hunting bag limit from 5 to 10 wolves/regulatory year. This change went into effect 1 July 2002 (after this reporting period). No emergency orders were issued that affected wolf hunting or trapping during this reporting period.

Hunter/Trapper Harvest. One hundred twelve wolves were sealed by hunters and trappers during 1999–2000, 45 during 2000–2001 and 68 during 2001–2002 (Table 1). Late snow and poor tracking conditions during 2000–2001 reduced the wolf harvest compared to 1999–2000 and 2001–2002. The harvest in 1999–2000 was the 3rd highest reported since 1974–1975.

Few residents of Unit 23 seal their wolves. Georgette (1999) reported that perhaps <10% of the actual harvest is reported through the sealing program. Combining all community harvest assessments that have been conducted in Unit 23 since 1998–1999 (n=6) yields an annual mean wolf harvest of 17.8 wolves/community (SD=18.1). Combining annual reported harvests from sealing data for these same communities (n=15) during 1999–2000 through 2001–2002 yields an annual mean wolf harvest of 5.1 wolves/community (SD=6.3). These figures suggest ~29% of the actual wolf harvest was sealed (Table 2). The percentage of the actual wolf harvest that was sealed may have been lower than 29% because 2 of the community harvest assessments provided wolf harvests that seem unreasonably low. Even so, using a 29% sealing rate suggests the actual Unit 23 wolf harvest may have approached 390 wolves in 1999–2000, 237 wolves in 2000–2001 and 157 wolves in 2001–2002.

It is generally accepted that >50% of all packs must be removed from an area before it has a lasting effect on the wolf population level. The public almost never totally eliminates an entire wolf pack because hunters quickly reach the point of diminishing returns after the pup cohort has been taken. If the Unit 23 wolf population is between the point estimate of 869 wolves and the upper 80% CI of 1169 wolves as estimated by Ballard (1993), a harvest of even 390 wolves would be sustainable without reducing wolf density. Admittedly, this entire exercise is very crude and is reported only to evaluate whether our wolf harvest and population data are reasonable.

Harvest levels reported through the fur sealing program can change dramatically when a department employee or protection officer visits a village and encourages hunters and trappers to seal their furs. That partially explains the high reported harvest in 1999–2000 when Trooper J. Rodgers visited a number of communities in Unit 23 and offered to seal furs. Therefore, the harvest levels reported here should be viewed as absolute minimum estimates of harvest.

Users continued to harvest wolves most heavily in the Kobuk River drainage during this reporting period (Table 3). This is undoubtedly because more people reside in this drainage than any other in Unit 23. Wolf harvests on the northern Seward Peninsula have increased during recent years.

Permit Hunts. There were no permit hunts for wolves in Unit 23 during the reporting period.

Hunter Residency and Success. The number of individuals who sealed wolves taken in Unit 23 has remained relatively stable since the late 1980s. Twenty-two individuals sealed wolves in each of the 1999–2000 and 2000-2001 regulatory years, and 26 sealed wolves during 2001–2002. During 1999–2000, all but 8 wolves were taken by residents of Unit 23 (5 by nonlocal residents and 3 by nonresidents). In 2000–2001, a nonlocal resident sealed 1 wolf and a nonresident sealed 1 wolf. During 2001–2002, nonlocal residents took 3 wolves and nonresidents took 6 wolves. All nonresident hunters harvested wolves opportunistically during fall while hunting moose or caribou.

Harvest Chronology. Most wolves taken during this reporting period were harvested between December and April (Table 4). This temporal harvest pattern was consistent with previous years.

Transport Methods. Hunters primarily used snowmachines to harvest wolves (Table 5). Some individuals used aircraft to access hunting areas and shot wolves while hunting other species. As in the past, most wolves harvested in Unit 23 were shot rather than trapped during this reporting period (Table 6). No one reported using snares to harvest wolves in Unit 23.

Other Mortality

There were no reports of wolf mortality due to causes other than hunting or trapping. We suspect rabies and canine distemper kill some wolves every year but the number is probably low.

HABITAT

Assessment and Enhancement

There were no habitat assessment activities or habitat enhancement projects for wolves in Unit 23 during the reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

Moose numbers have declined to low levels in large portions of Unit 23 (0.1-0.3 moose/mi^2). Predation by black and brown bears, and by wolves, especially on moose calves, has undoubtedly contributed to this decline. However, predation isn't the only factor reducing moose numbers here. Several severe winters during the early 1990s caused many moose to starve. Since that time wolf numbers remained stable, brown bear numbers may have increased and numbers of nonlocal moose hunters have steadily increased. Additionally, Unit 23 is at the margin of moose range in Alaska. Although the habitat appears capable of supporting higher numbers of moose than are currently present here, snow conditions often preclude access to this food. All of these factors have reduced moose numbers in Unit 23.

The predator control component of 'intensive management' would probably be ineffective for increasing moose numbers in Unit 23 because >60% of the unit is federal public land. Therefore, since the early 1990s the state has incrementally liberalized brown bear and wolf hunting regulations to afford the public greater opportunity to harvest these species thereby reducing predation on moose and sheep.

CONCLUSIONS AND RECOMMENDATIONS

Harvest data should be interpreted with caution given the generally poor and inconsistent compliance with fur sealing requirements throughout Unit 23. Likewise, the unit-wide estimate of wolf density reported by Ballard (1993) should be viewed with caution because that estimate is now >10 years old and was based on a large extrapolation of wolf density from a small study area.

The Department should continue to conduct community harvest assessments in selected communities within Unit 23. In addition, hunters and trappers should be encouraged to seal their furs.

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Table 1 Reported wolf harvest from sealing certificates for Unit 23, 1974–1975 through 2001–2002

Regulatory year	Males	Females	Unknown	Total
1974–1975	–	–	50	50
1975–1976	–	–	142	142
1976–1977	–	–	157	157
1977–1978	–	–	65	65
1978–1979	–	–	50	50
1979–1980	12	6	0	18
1980–1981	33	17	0	50
1981–1982	10	7	0	17
1982–1983	25	19	4	48
1983–1984	30	14	2	46
1984–1985	45	20	0	65
1985–1986	10	8	1	19
1986–1987	23	10	1	34
1987–1988	52	33	9	94
1988–1989	42	36	5	83
1989–1990	27	25	5	57
1990–1991	17	15	13	45
1991–1992	30	22	6	58
1992–1993	28	32	11	71
1993–1994	30	17	3	50
1994–1995	24	19	10	53
1995–1996	35	25	3	63
1996–1997	30	18	13	61
1997–1998	6	12	5	23
1998–1999	11	10	9	30
1999–2000	69	41	2	112
2000–2001	25	16	4	45
2001–2002	39	14	15	68

Table 2 Comparison of wolf harvests from community harvest assessments and fur sealing documents in selected communities within Unit 23, 1999–2002

Community	Community harvest estimate	Fur Sealing Data		
		1999-2000	2000-2001	2001-2002
Kiana (1999)	17	0	4	0
Noatak (1999)	15	0	4	7
Noatak (2001–2002)	3			
Noorvik (2002)	52	20	15	5
Selawik (1999)	2	0	0	0
Shungnak (1998–	18	10	11	1

Table 3 Wolf harvest by drainage in Unit 23, 1974–1975 through 2001-2002

Regulatory year	Kivalina -Wulik	Noatak	Kobuk	Selawik	N. Seward	Unknown	Total
1974–1975	3	5	22	20	0	0	50
1975–1976	2	9	78	53	0	0	142
1976–1977	0	26	28	82	1	10	157
1977–1978	0	3	25	20	1	70	65
1978–1979	7	4	11	15	1	30	50
1979–1980	1	2	9	4	2	0	18
1980–1981	2	3	11	24	3	7	50
1981–1982	1	10	3	3	0	0	17
1982–1983	1	11	6	21	8	1	48
1983–1984	0	9	7	21	7	2	46
1984–1985	1	16	20	21	3	4	62
1985–1986	0	11	4	2	2	0	19
1986–1987	2	5	6	18	0	2	34
1987–1988	0	27	41	11	15	0	94
1988–1989	1	12	28	39	0	3	83
1989–1990	3	10	27	2	15	0	57
1990–1991	0	7	18	15	5	0	45
1991–1992	2	8	30	4	13	1	58
1992–1993	2	11	30	15	4	9	71
1993–1994	0	17	28	3	2	0	50
1994–1995	1	12	26	7	7	0	53
1995–1996	0	11	27	18	7	0	63
1996–1997	6	9	24	15	7	0	61
1997–1998	0	2	17	0	0	4	23
1998–1999	0	6	12	1	10	0	29
1999–2000	0	8	60	13	13	0	112
2000–2001	3	9	28	2	3	0	45
2001–2002	0	8	35	10	15	0	68

Table 4 Chronology of wolf harvest for Unit 23 from 1993–1994 through 2001-2002

Reg. year	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unknown	Total
1993–1994	1	2	0	3	11	7	5	6	10	5	50
1994–1995	0	1	0	10	3	8	8	14	9	0	53
1995–1996	0	2	0	6	5	2	1	37	9	1	63
1996–1997	0	2	2	4	14	7	12	14	0	6	61
1997–1998	0	1	0	0	5	0	5	2	6	4	23
1998–1999	0	2	0	1	5	6	7	7	1	1	30
1999–2000	1	2	0	4	8	31	5	36	15	10	112
2000–2001	5	8	0	1	3	2	12	13	0	1	45
2001–2002	0	3	0	1	6	4	19	19	7	9	68

Table 5 Number of users (hunters and trappers combined) and method of transport to harvest wolves in Unit 23, 1985–1986 through 2001-2002

Reg. year	Hunters	Airplane	Snow-machine	Boat	Dog team	Highway vehicle	Off road vehicle	Unk.	Total harvest
1985–1986	12	8	7	0	0	0	0	4	19
1986–1987	17	20	9	0	0	0	0	5	34
1987–1988	32	48	40	2	0	0	0	4	94
1988–1989	29	10	70	0	0	0	0	3	83
1989–1990	25	11	32	2	0	0	0	12	57
1990–1991	23	4	32	0	0	0	0	9	45
1991–1992	25	9	47	0	0	0	0	2	58
1992–1993	24	2	69	0	0	0	0	0	71
1993–1994	24	2	44	0	0	0	0	4	50
1994–1995	21	1	52	0	0	0	0	0	53
1995–1996	20	1	62	1	0	0	0	0	63
1996–1997	23	5	48	3	5	0	0	0	61
1997–1998	12	1	18	0	0	0	0	4	23
1998–1999	13	2	28	0	0	0	0	0	30
1999–2000	22	4	103	0	0	1	0	0	112
2000–2001	22	3	63	0	0	0	0	2	68
2001–2002	26	7	34	3	0	0	0	1	45

Table 6 Methods of harvesting wolves in Unit 23, 1985–1986 through 2001-2002

Reg. year	Shot	Trapped	Snared	Unknown	Total harvest
1985–1986	14	2	0	3	19
1986–1987	26	4	0	4	34
1987–1988	90	2	0	2	94
1988–1989	72	9	0	2	83
1989–1990	45	8	0	4	57
1990–1991	32	3	3	7	45
1991–1992	43	7	0	8	58
1992–1993	69	2	0	0	71
1993–1994	44	4	0	2	50
1994–1995	41	12	0	0	53
1995–1996	42	19	0	2	63
1996–1997	50	11	0	0	61
1997–1998	12	7	0	4	23
1998–1999	20	8	0	2	30
1999–2000	89	23	0	0	112
2000–2001	58	8	0	2	66
2001–2002	33	11	0	1	45

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNIT: 24 (26,055 mi^2)

GEOGRAPHIC DESCRIPTION: Koyukuk River drainage above Dulbi River

BACKGROUND

Wolves are present throughout Unit 24. Historically, wolf abundance in Unit 24 has fluctuated in response to prey availability. Numbers were low in the Brooks Range during the late 1800s because densities of moose, caribou, and Dall sheep were low (Campbell 1974). Prey populations increased during the early 1900s, leading to concurrent increases in wolf numbers. Now wolves are more numerous than in the 1970s but probably not as abundant as during the 1940–1950s (Woolington 1997).

There are probably more wolves in the southern portion of the unit now than before the 1940s because a stable prey base is available. Prior to 1945, moose were uncommon and caribou numbers fluctuated in Unit 24. Moose rapidly increased in the 1940s and 1950s coincident with federal wolf control. When wolf control ceased in the late 1950s, the abundance of moose allowed wolf numbers to increase. Wolf numbers are presently as high in southern Unit 24 as at any time known.

Reported wolf harvests during regulatory year (RY) 1989 through RY01 were 30–119 wolves per year and averaged 74 wolves annually (RY = 1 Jul through 30 Jun, e.g., RY01 = 1 July 2001 through 30 June 2002). The local demand for wolf pelts used as parka ruffs and gifts at funeral potlatches has traditionally been high. Additionally, local residents perceive wolves as direct competitors for moose and often make a conscious effort to increase the wolf harvest when moose seem scarce.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. The domestication of wolves for personal use or for

commercial purposes is generally considered incompatible with department management policies. The management goals, objectives, and activities for this reporting period were:

MANAGEMENT GOALS

- Ensure long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.
- Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.
- Increase public awareness and understanding of uses, conservation and management of wolves, their prey, and habitat in Alaska.

MANAGEMENT OBJECTIVES

- Maintain a fall density of 13–23 wolves/1000 mi^2 (5–9 wolves/1000 km^2).
- Provide for a total annual harvest of 112–162 wolves.
- Increase trapper participation in statewide trapper survey by at least 1% annually.

MANAGEMENT ACTIVITIES

- Conduct surveys to estimate population size and density.
- Model the potential effects of wolf predation on ungulates in each unit (McNay and DeLong 1998).
- Monitor harvest through sealing records and trapper questionnaires.
- Monitor wolf numbers and population characteristics through interviews with trappers, hunters, pilots, and by evaluation of sealing documents.
- Conduct trapper education clinics.

METHODS

We worked cooperatively with the US Fish and Wildlife Service to estimate the late winter wolf population and pack size using aerial surveys. In March 2000 a Sample Unit Probability Estimator (SUPE) survey (Becker et al. 1998) was conducted in the southern portion of Unit 24. Population data were summarized by regulatory year.

A wolf reconnaissance survey was flown in a limited area of Unit 24 and the northern portion of Unit 21D in March 1999 using SUPE methodology. However, we were unable to satisfy assumptions required for application of the technique because of poor snow conditions. Therefore, a minimum estimate for the area was developed from that survey (ADF&G files, Galena, 7 May 1999).

Wolves harvested by trappers and hunters were sealed to monitor harvest. Information recorded for each wolf included date of kill, name of trapper or hunter, location of kill, method of take and transportation, sex of the wolf, color of the pelt, and the number of other wolves thought to be in the pack. Trapper interviews were also used to monitor harvest. Data were summarized by regulatory year.

We conducted wolf snaring and trapper education courses during RY99 and RY01 in local villages to improve trapper skills and knowledge of wildlife management issues.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Wolves occur throughout the unit in all habitat types and often near human settlements. The number of wolves varies, depending on availability of prey. There are more wolves in the south and north than in the central portion of the unit, which has lower moose densities and more sporadic movements of caribou.

A series of geographically overlapping surveys completed during late winters 1994 through 2000 indicated the wolf population may have increased in the southern portion of Unit 24 and adjacent Unit 21D. The SUPE survey completed in March 2000 in the southern portion of Unit 24 indicated there were 148 wolves (±32, 90% CI) over a 4175-mi^2 survey area for a density of 36 wolves/1000 mi^2 (14 wolves/1000 km^2). The reconnaissance survey completed in March 1999 in southern Unit 24 and adjacent Unit 21D indicated a density of 32 wolves/1000 mi^2 (12 wolves/1000 km^2). A 1994 survey in adjacent Unit 21D indicated a density of 23 wolves/1000 mi^2 (9 wolves/1000 km^2).

In RY95 the estimated Unit 24 fall population was 405–540 wolves (Table 1). It was derived by plotting known pack locations and by assuming a density of 15–21 wolves/1000 mi^2 (6–8 wolves/1000 km^2) for unknown areas. No new information about unsurveyed areas was obtained during RY99–RY01 in the central and northern portion of the unit. Therefore, the same density was used for these areas when we estimated the unitwide population during RY99–RY02.

The unitwide fall population probably did not change during RY99–RY02. In the northern portion of the unit, there were probably 155–206 wolves, with a density of 15–21 wolves/1000 mi^2 (6–8 wolves/1000 km^2). In the central portion of the unit there were probably 103–155 wolves, with a density of 10–15 wolves/1000 mi^2 (4–6 wolves/1000 km^2). In southern Unit 24 the SUPE indicated 116–180 wolves. Therefore, the estimated fall population for the entire unit was 374–541 during RY99–RY01.

DISTRIBUTION AND MOVEMENTS

Radiotelemetry of wolves in the Kanuti National Wildlife Refuge indicated that 85–100 wolves in 9–11 packs used the refuge during fall (Zirkle 1995). Packs roamed over 2556–

4059 mi^2, and average pack size was 4. All wolves that were pups or yearlings when collared dispersed from the area and were not followed.

Packs are known to migrate into Unit 24 during the winter with the Western Arctic caribou herd. These wolves are mostly found in Gates of the Arctic National Park and Preserve and in the Upper Huslia and Hogatza Rivers (D James, ADF&G, personal communication). Unpredictability of these migrations is responsible for most of the variation of the wolf population estimates for the portion of the unit in Gates of the Arctic National Park and Preserve.

MORTALITY

Harvest

Seasons and Bag Limits.

Units and Bag Limits	Resident Open Seasons	Nonresident Open Seasons
Unit 24		
HUNTING: 5 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit.	1 Nov–30 Apr	1 Nov–30 Apr

Alaska Board of Game Actions and Emergency Orders. At their 1993 meeting, the Board of Game continued the ban on same day hunting of wolves, but allowed taking wolves the same day airborne under trapping regulations, provided the trapper moved 300 feet from the aircraft before taking a free-ranging wolf. Beginning in RY97 same-day airborne harvest was eliminated in the trapping regulations as well. Beginning in RY95 the trapping season was extended through April. Wolves could be taken under either hunting or trapping regulations. No new regulations were adopted during RY99–RY01.

Hunter–Trapper Harvest. Hunters and trappers reported harvesting 91, 81, and 71 wolves during RY99, RY00 and RY01, respectively (Table 2). The actual number harvested was probably higher because most village residents seal only those wolf pelts sent to a commercial tannery or sold to a fur buyer. Hunting and trapping conditions vary from year to year, which affects harvests. The estimated unreported harvest can be up to 80 wolves/year under good conditions and 50 wolves/year under poor conditions (Woolington 1997).

Harvest Chronology. Wolves were generally taken in January, February, and March during RY91–RY01 (Table 3). The exception was RY97 and RY99 when November and December were also important months. Like nearby Unit 21D, incidental harvest in the fall increased slightly during RY99–RY01, possibly due to increased sightings during the fall moose season.

Transport Methods. Most wolves were taken using snowmachines for transportation during RY92–RY01 (Table 4). No other trends in transportation methods were apparent.

CONCLUSIONS AND RECOMMENDATIONS

The unitwide wolf population was stable during RY99–RY01 and has shown little change since RY93, with some localized annual fluctuations. Wolf numbers were highest (9–11 wolves/1000 km^2) and probably increased in the southern portion of the unit (south of Hughes). There were moderate, stable numbers (4–6 wolves/1000 km^2) in the central portion of the unit (Bettles to Hughes), and variable numbers (6–8 wolves/1000 km^2) with some declines in the north (north of Bettles).

Management objectives were met during RY99–RY01. With respect to the first objective, to maintain a fall density of 13–23 wolves/1000 mi^2 (5–9 wolves/1000 km^2), the fall wolf population was stable with an estimated 14.4–24.5 wolves/1000 mi^2 (5.5–8.0 wolves/1000 km^2). With an estimated population of 374–541 wolves, this provided for a harvest of at least 130–190 wolves, which met the second objective, to provide for a total annual harvest of 112–162 wolves. With respect to the third objective, to improve trapper questionnaire response, there was 100% increase in RY99 (n = 26) over the number that were returned in RY98 (n = 13), and in RY00 (n = 31) the increase in response was 19% from the previous year.

Harvest monitoring was an important part of the wolf management program. It included the statewide sealing system, trapper questionnaires, and trapper interviews. Trapper education courses were conducted and proved effective in teaching new techniques and ways to avoid accidental snaring of moose. An aerial wolf survey was planned but not completed in the central portion of the unit due to persistently poor survey conditions.

I recommend an aerial survey be conducted to determine wolf densities in the central portion of Unit 24. I also recommend continued monitoring of radiocollared packs in the Kanuti area to improve population estimates and to provide information on predation rates. Additionally, I recommend federal and state biologists work closely with local residents to improve harvest reporting compliance.

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TABLE 1 Unit 24 fall wolf population estimates[a], regulatory years 1988–1989 through 2002–2003

Regulatory year	Population estimate[b]	Number of packs
1988–1989	420–450	55–60
1989–1990	400–440	55–60
1990–1991	400–440	55–60
1991–1992	420–450	68–70
1992–1993	388–415	51–55
1993–1994	405–540	58–66
1994–1995	405–540	58–66
1995–1996	405–540	58–66
1996–1997	374–541	58–66
1997–1998	374–541	58–66
1998–1999	374–541	58–66
1999–2000	374–541	58–66
2000–2001	374–541	57–68
2001–2002	374–541	57–68
2002–2003	374–541	57–68

[a] Fall estimate = pretrapping season population.
[b] Basis of estimate: Alaska Department of Fish and Game, National Park Service, and US Fish and Wildlife Service aerial surveys, hunter/trapper reports, sealing records, and incidental observations.

TABLE 2 Unit 24 wolf harvest, regulatory years 1988–1989 through 2001–2002

Regulatory year	Reported harvest				Estimated unreported harvest	Total estimated harvest	Method of take			
	M	F	Unk	Total			Trap/snare	Shot	SDA[a]	Unk
1988–1989	38	32	6	76	50	126	16	20	39	1
1989–1990	17	9	4	30	60	90	25	3	0	2
1990–1991	16	24	2	42	60	102	22	20	0	0
1991–1992	42	39	4	85	55	140	70	15	0	0
1992–1993	41	32	6	79	80	159	43	35	1	0
1993–1994	48	37	4	89	60	149	62	27	0	0
1994–1995	52	28	9	89	60	149	68	14	6	1
1995–1996	52	55	12	119	60	179	88	29	2	0
1996–1997	45	38	5	88	60	148	73	13	0	2
1997–1998	32	20	4	56	50	106	46	9	0	1
1998–1999	19	12	5	36	50	86	31	5	0	0
1999–2000	50	32	9	91	50	141	70	14	0	7
2000–2001	36	31	14	81	50	131	57	20	0	4
2001–2002	33	36	2	71	50	121	51	20	0	0

[a] Animals taken by hunters the same day hunters or trappers were airborne.

TABLE 3 Unit 24 wolf harvest chronology percent by month, regulatory years 1991–1992 through 2001–2002

Regulatory year	Harvest periods							
	Aug–Oct	Nov	Dec	Jan	Feb	Mar	Apr	*n*[a]
1991–1992	7	14	18	22	25	8	6	85
1992–1993	3	1	8	7	32	50	0	92
1993–1994	7	7	20	10	25	26	7	92
1994–1995	7	6	8	18	33	27	1	83
1995–1996	7	13	21	13	25	8	13	107
1996–1997	8	10	15	22	30	16	0	88
1997–1998	9	15	35	15	20	7	0	55
1998–1999	6	11	17	22	22	22	0	36
1999–2000	8	19	33	8	10	18	4	84
2000–2001	16	6	10	22	30	13	3	77
2001–2002	11	8	11	15	27	25	1	71

[a] Includes harvest records received after total harvest was calculated.

TABLE 4 Unit 24 wolf harvest percent by transport method, regulatory years 1991–1992 through 2001–2002

Regulatory year	Percent of harvest								
	Airplane	Dogsled, Skis, Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway Vehicle	Unk	*n*[a]
1991–1992	18	51	32	0	0	0	0	0	85
1992–1993	3	0	0	0	89	1	4	2	92
1993–1994	3	4	3	0	83	0	1	5	92
1994–1995	16	0	6	1	73	0	3	1	88
1995–1996	3	7	2	2	69	3	4	10	107
1996–1997	3	0	3	0	90	0	1	2	88
1997–1998	4	5	2	0	86	0	2	2	56
1998–1999	0	3	6	3	72	0	17	0	36
1999–2000	4	1	2	1	66	0	16	10	91
2000–2001	1	10	9	1	69	0	5	10	81
2001–2002	1	4	6	0	68	0	6	15	71

[a] Includes harvest records received after total harvest was calculated.

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNITS: 25A, 25B, 25D, 26B, and 26C (73,756 mi^2)

GEOGRAPHIC DESCRIPTION: Eastern Interior, Eastern Brooks Range, and Central and Eastern Arctic Slope

BACKGROUND

Wolves are found throughout this management area. They are well adapted to living in the Interior boreal forests, the mountains of the Brooks Range, and the tundra on the Arctic slope. Wolves are generally less abundant than in other parts of the Interior because populations of resident prey such as moose are scarce in many areas.

Detailed information about wolf populations and their influence on ungulate populations in northeastern Alaska is limited. US Fish and Wildlife Service biologists studied the movements and denning habits of 11 wolf packs in the northern Arctic National Wildlife Refuge (ANWR) in Unit 26C in 1984 and 1985 (Garner and Reynolds 1986). Subsequent aerial surveys and incidental observations documented the widespread presence of wolves within ANWR and to the west in Unit 26B. However, no systematic surveys have been conducted in Unit 26B. Aerial wolf population surveys were completed in Unit 25D West in March 1983 and 1984 (Nowlin 1985). Wolf surveys covering portions of Unit 25D were completed in March 1992, 1997, and 1999, and in Unit 25D and part of Unit 25B in 2000 and 2001. The results of a telemetry study of wolves in southern Unit 25B are described by Burch (2002). No systematic surveys have been conducted in Unit 25A.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Wolf populations will be managed to provide for human uses and to ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational purposes. The aesthetic value of being aware of or observing wolves in natural interactions within their environment is also recognized as an important human use of wolves. The domestication of wolves for personal or commercial purposes is generally considered incompatible with department management policies.

Management may include manipulation of wolf population size and total protection of wolves from human influence. All human uses might not occur in all areas or at all times; management will focus on providing sustained, diverse human uses of wolf populations consistent with goals listed in the Wolf Conservation and Management Policy for Alaska, adopted by the Alaska Board of Game 30 October 1991 and revised 29 June 1993. These goals are listed below:

- Ensure the long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.

- Provide for the broadest possible range of human uses and values of wolves and their prey populations, consistent with wildlife conservation principles and the public interest.

- Increase public awareness and understanding of the conservation and management of wolves, their prey, and habitat in Alaska.

MANAGEMENT OBJECTIVE

The Alaska Board of Game has not adopted an implementation plan for control of wolf predation in any of these units, although this could occur in the future. However, the Yukon Flats Cooperative Moose Management Plan was completed and endorsed by the board in 2002. It outlines strategies to increase moose numbers, including increasing the harvest of bears and wolves. Management in Units 26B and 26C will continue to be directed at maintaining a sustainable harvest and accommodating nonconsumptive uses of wolves. Management objectives for Units 25D and 25B will be revised for the next reporting period. The objective for this reporting period is listed below.

- Provide for a sustained annual harvest rate of no more than 30% of the total combined wolf population in Units 25A, 25B, and 25D; and no more than 30% of the combined wolf population of Units 26B and 26C.

MANAGEMENT ACTIVITIES

- Use sealing records and trapper questionnaires to monitor harvest.

- Continue to evaluate the effects of wolf predation on moose in Unit 25D using computer modeling.

- Monitor wolf numbers and population characteristics outside survey areas through interviews with trappers, hunters, and pilots and by evaluation of sealing documents.

- Participate in trapper education to enhance trapper skills and ethics and improve compliance with regulations.

- Conduct periodic wolf population surveys in Units 25B, 25D East, and 25D West.

METHODS

Population estimates in Unit 25D and parts of Unit 25B were based on aerial track surveys completed in late winter 1983, 1984, 1992, 1996, 1998, 2000 and 2001. Population estimates in a large part of Units 25A, 25B, 26B and 26C were based on earlier surveys, incidental observations of wolves by agency personnel and the public, and extrapolation of population estimates from surveys in similar habitat elsewhere. Aerial track surveys were conducted in late winter with PA-18 Super Cub or Scout aircraft flown at 400–500 ft above ground level and generally occurred 3–5 days after snowfall.

Wolves harvested by hunters and trappers were sealed to monitor harvest. Information recorded for each wolf included date and location of kill, name of trapper or hunter, method of take and transportation, sex of the wolf, color of the pelt, and the number of other wolves thought to be in the pack. Data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY00 = 1 Jul 2000–30 Jun 2001).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population density is low relative to other parts of the Interior where prey are more abundant. Wolf populations in Units 25A, 25B, 25D, 26B, and 26C appeared to be stable, but data on population trends are limited, except in Unit 25D.

Population Size

In fall 1992, estimates from surveys, hunter observations, and harvest data indicated that 72–93 packs, including 520–630 wolves, were present in Units 25A, 25B, and 25D and 150–215 wolves in 22–32 packs were present in Units 26B and 26C. These estimates are still considered representative, based in part on the results of recent surveys in Unit 25. Fall wolf population density is estimated at 5.7–8.3 wolves/1000 mi^2 (2.2–3.2/1000 km^2) in Units 26B and 26C. Resident packs are rare on the coastal plain in the northern portion of these subunits (Garner and Reynolds 1986). Wolf population density in western Unit 25D was estimated at 7.3–9.1 wolves/1000 mi^2 (2.8–3.5/1000 km^2) based on aerial surveys in 1983 and 1984 (Nowlin 1985). A 1992 aerial survey encompassing most of Unit 25D indicated wolf density averaged about 8.8–10.6 wolves/1000 mi^2 (3.4–4.1/1000 km^2). Aerial surveys in 1997 and 1999 resulted in estimates of 12.2–14.5 wolves/1000 mi^2 (4.7–5.6/1000 km^2) in Unit 25D West, and 9.6–11.1 wolves/1000 mi^2 (3.7–4.3/1000 km^2) in western and central Unit 25D. Average pack size was 5–7 wolves in most of the area.

A March 2000 aerial survey indicated 125–133 wolves were present in a 35,700 km^2 area of southern Unit 25B and eastern Unit 25D, with a density of 9.1–9.8 wolves/1000 mi^2 (3.5–3.8/1000 km^2). Group size ranged from 1–13 wolves and averaged 4.6. Mean group size was 5.3 wolves for groups containing more than 2 wolves (n = 23). During the survey, biologists observed 65 wolves (26 black and 39 gray or white) and the remains of 34 moose and 1 caribou that were apparently killed by wolves.

In April 2001 we estimated 181–204 wolves (10.9–12.3 wolves/1000 mi^2 [4.2–4.7/1000 km^2]) within a 26,703-mi^2 (43,000 km^2) survey area including eastern Unit 25D and central Unit 25B. Groups included 1–12 wolves and groups of 3 or more wolves averaged 4.6. We identified 31 packs of 3 or more, 6 pairs, and 7 lone wolves. During the survey, biologists observed 98 wolves (34 black and 64 gray) and remains of 29 wolf-killed moose. No surveys were completed in 2002 because of a lack of suitable snow conditions.

Based on a 9-year telemetry study involving an average of 10 packs annually, Burch (2002) reported that wolf population density averaged 10.6 wolves/1000 mi^2 (4.1/1000 km^2) in Yukon–Charley Rivers National Preserve (YCRNP), including part of Unit 25B. Fall pack size averaged 7.2 wolves, ranged from 4.3 to 9.1, and appeared to be increasing as a result of the growth of the Fortymile caribou herd.

Distribution and Movements

Radiocollared wolves in northern ANWR were members of packs in the Canning, Sadlerochit, Aichilik, Kongakut, Hulahula, Egaksrak, Drain, and Malcom drainages (Garner and Reynolds 1986). Several lone wolves were also radiocollared. Relocations indicated wolves did not follow caribou to their winter ranges but generally remained within the same pack territories all year. Wolves preyed primarily on caribou from spring to fall but switched to Dall sheep, moose, and small game in winter when caribou were not present. Several wolves dispersed as far as 500 miles from their home range (Garner and Reynolds 1986). Burch (2002) reported an average home range of 886 mi^2 (2295 km^2) for wolf packs in YCRNP, and that 28% of 91 radiocollared wolves dispersed from 30 to 470 km.

MORTALITY

Harvest

Season and Bag Limit. The hunting season in Units 25 and 26 was open from 10 August through 30 April during RY99–RY01. The bag limit was 5 wolves in Unit 25 and 10 wolves in Unit 26; however, same-day-airborne hunting of wolves was prohibited. The trapping season in both areas was 1 November–30 April, with no bag limit. In accordance with trapping regulations, wolves caught in traps or snares could be taken by shooting the same day a trapper was airborne.

Units/Bag Limits/Special Restrictions	Resident/Subsistence Open Season	Nonresident Open Season
RY99–RY01		
Units 25A, 25B, and 25D		
HUNTING: 5 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit.	1 Nov–30 Apr	1 Nov–30 Apr
Units 26B and 26C		
HUNTING: 10 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit.	1 Nov–30 Apr	1 Nov–30 Apr
RY02		

Units/Bag Limits/Special Restrictions	Resident/Subsistence Open Season	Nonresident Open Season
Units 25A, 25B, and 25D		
HUNTING: 10 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit.	1 Nov–30 Apr	1 Nov–30 Apr
Units 26B and 26C		
HUNTING: 10 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit.	1 Nov–30 Apr	1 Nov–30 Apr

Alaska Board of Game Actions and Emergency Orders. In March 2002 the Alaska Board of Game increased the bag limit from 5 wolves to 10 wolves for the hunting season in Units 25A, 25B, and 25D beginning in RY02.

Hunter–Trapper Harvest. Annual wolf harvests in the reporting area were relatively stable during RY99–RY01 (range 51–79) (Table 1). The 3-year average harvest for RY99–RY01 was 66 compared to 56 for the previous 3 years (RY96–RY98). During RY99–RY01, 27% of the harvest occurred in Unit 25A, 24% in Unit 26B, 19% in Unit 25D, 18% in Unit 25B, and 13% in Unit 26C. The pattern is similar to the previous 3 years (RY96–RY98). Harvest during the early to mid-1990s was somewhat higher (3-year average RY90–RY92 was 86 and RY93–RY95 was 78). The decline in harvest was probably a reflection of reduced fur prices, poor snow conditions, and reduced trapping effort.

Wolves were reported taken in scattered locations in Unit 25 including parts of the Coleen, Sheenjek, Hodzana, and Chandalar drainages in Unit 25A; the Black and Porcupine drainages in Unit 25B; and in the Birch, Beaver, Hodzana, Porcupine, and Yukon drainages in Unit 25D. In Unit 26B wolves were taken at scattered locations near the trans-Alaska pipeline corridor from the Atigun River north to Sagwon. Few wolves were harvested in Unit 26C, probably because of limited access and low wolf density. Most wolves harvested in Unit 26C were taken on the Canning River and in various drainages south of Barter Island. Harvests generally included more males than females. Some unreported harvest occurs, primarily in Units 26B and 26C, where hides are often used in clothing and handicrafts (Whitten 1988).

During RY99–RY01 the number of wolves harvested in Unit 25A with traps or snares and by shooting from the ground was similar. In previous years, trapping or snaring was the predominant method of take. In Units 25B and 25D, wolves were taken primarily by trapping or snaring, probably because these are the most effective methods in forested terrain. In Unit 26B, 61% of the wolves were taken by shooting from the ground and 39% by trapping or snaring, similar to previous years. In Unit 26C, 67% of the wolves were taken by trapping or snaring and 33% were taken by shooting from the ground. In previous years shooting from the ground was the primary method of take in Unit 26C. Prior to 1988, when same-day-airborne hunting was prohibited, the predominant method of take for the entire reporting area was the land-and-shoot method involving aircraft.

Harvest Chronology. Most reported wolf harvest occurred from November through March, although a few wolves were taken in August or September (Table 2).

Transport Methods. Over most of the reporting area, snowmachines were the most common method of access, and their use has changed little over the years (Table 3). In Unit 26B most hunters and trappers used highway vehicles to reach the area by the Dalton Highway. Individuals using dogsled/skis/or snowshoes or aircraft took few wolves. The use of dogsled/skis/or snowshoes increased in winters with little snowfall because trappers were unable to use snowmachines.

Natural Mortality

The relatively low density of wolves in northeastern Alaska is consistent with the relative scarcity of prey. Moose populations are generally at low density, and caribou are only seasonally abundant because of their wide-ranging migrations.

The high number of predators relative to prey in the area indicates that predation is a major factor affecting prey population dynamics. Population modeling exercises using the PredPrey model recently developed by Alaska Department of Fish and Game (McNay and DeLong 1998) were used to explore effects of predation by wolves and bears on moose populations on the Yukon Flats. These simulations indicate that wolf predation plays an important role in limiting moose numbers, which are likely to remain near a low-density equilibrium unless predation is reduced. Small packs, small litters, and low pup survival are characteristic of wolf populations in areas where prey are relatively scarce. Garner and Reynolds (1986) reported that 8 of 11 packs studied in ANWR included 5 or fewer wolves, with low pup production and survival. Summer pup survival rates for packs of <5 wolves were 23–25%, while larger packs had nearly 100% pup survival. Burch (2002) reported that packs in YCRNP produced an average of 3.7 (range, 1.4–4.9) pups annually.

Rabies and predation by other wolves (Zarnke and Ballard 1987) are probably the major causes of natural mortality among adult wolves in northeastern Alaska. Rabies in wolves is generally confined to coastal areas in northern and western Alaska, including Units 26B and 26C.

CONCLUSIONS AND RECOMMENDATIONS

Wolves continue to be widely distributed in northeastern Alaska, and the number of wolves harvested was low relative to population size. During RY99–RY01, reported harvest accounted for a maximum of 7–9% of the estimated population in Units 25A, 25B, and 25D and 7–23% of the population in Units 26B and 26C. Harvests were well below the maximum sustainable level of 30–35% generally reported for wolf populations. However, where ungulate populations are low, as in Units 25 and 26, the sustainable harvest rate can be lower. Wolf population density continues to be relatively low compared to areas where prey is more abundant. I recommend continued monitoring of wolf populations, particularly in the most important moose hunting areas in Units 25B and 25D. Likewise, the status of prey populations should be closely monitored in these areas.

People throughout the study area and especially in Units 26B and 26C should be periodically reminded of the requirement to seal wolf pelts. We should continue efforts to develop and maintain fur sealing officers in communities in the region.

Wolf management goals were generally met. We met our objective of providing for a sustained annual harvest rate of no more than 30% from the combined wolf population in Units 25A, 25B, 25D; and the wolf population in Units 26B and 26C. Management objectives for Unit 25D should be revised to support the goals of the Yukon Flats Cooperative Moose Management Plan, which was completed in 2002. Moose populations are currently limited by predation and wolves are an important predator on moose (Gasaway et al. 1992; ADF&G, unpublished data). The Alaska Board of Game has designated the moose population in Unit 25D as important for providing high levels of human consumptive use. Under the state's intensive management law, the board must consider intensive management if regulatory action to significantly reduce moose harvest becomes necessary because of a decline in numbers or productivity. One of the goals of the Yukon Flats Cooperative Moose Management Plan is to increase moose numbers. The plan identified the need to reduce predation by grizzly bears, black bears, and wolves. The wolf management goals and objectives are revised as follows for the next reporting period:

MANAGEMENT GOAL

- Provide maximum opportunity to participate in hunting and trapping wolves in Unit 25D.

MANAGEMENT OBJECTIVES

- Provide for a sustained annual harvest rate of no more than 30% of the total combined wolf population in Units 25A and 25B; and no more than 30% of the combined wolf population of Units 26B and 26C.

- Manage for a temporary reduction in wolf numbers and predation on moose in Unit 25D. After moose populations increase to desired levels, manage for a sustained annual harvest of no more than 30% annually.

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TABLE 1 Units 25A, 25B, 25D, 26B, and 26C wolf harvest, regulatory years 1987–1988 through 2001–2002

Regulatory	Reported harvest				Method of take		
year	M	F	Unk	Total	Trap/snare	Shot	Unk
Unit 25A							
1987–1988	14	16	0	30	7	23	0
1988–1989	2	6	2	10	6	4	0
1989–1990	5	9	0	14	8	6	0
1990–1991	15	6	2	23	18	5	0
1991–1992	7	11	7	25	14	11	0
1992–1993	20	7	0	27	11	16	0
1993–1994	8	10	0	18	15	3	0
1994–1995	7	10	0	17	17	0	0
1995–1996	12	12	0	24	14	10	0
1996–1997	9	8	0	17	17	0	0
1997–1998	5	11	0	16	13	3	0
1998–1999	11	6	1	18	15	3	0
1999–2000	7	7	1	15	8	7	0
2000–2001	18	7	0	25	13	12	0
2001–2002	6	7	0	13	5	8	0
Unit 25B							
1987–1988	4	1	1	6	5	1	0
1988–1989	3	4	5	12	12	0	0
1989–1990	3	1	1	5	4	1	0
1990–1991	2	2	1	5	4	1	0
1991–1992	7	5	1	13	13	0	0
1992–1993	7	7	1	15	14	1	0
1993–1994	6	1	5	12	11	1	0
1994–1995	4	9	3	16	16	0	0
1995–1996	5	9	0	14	12	2	0
1996–1997	5	5	0	10	9	1	0
1997–1998	8	9	0	17	17	0	0
1998–1999	5	2	1	8	7	1	0
1999–2000	11	7	1	19	18	0	1
2000–2001	3	5	0	8	7	1	0
2001–2002	3	5	0	8	7	1	0
Unit 25D							
1987–1988	2	2	2	6	6	0	0
1988–1989	0	0	2	2	2	0	0
1989–1990	6	5	1	12	9	3	0
1990–1991	14	10	0	24	6	18	0
1991–1992	8	11	0	19	9	10	0
1992–1993	2	1	8	11	9	1	1
1993–1994	10	7	2	19	17	2	0
1994–1995	18	12	2	32	31	1	0

Regulatory year	Reported harvest				Method of take		
	M	F	Unk	Total	Trap/snare	Shot	Unk
1995–1996	12	5	0	17	11	6	0
1996–1997	12	6	1	19	16	3	0
1997–1998	8	1	1	10	6	4	0
1998–1999	1	1	2	4	3	1	0
1999–2000	4	2	1	7	6	0	1
2000–2001	6	2	3	11	9	1	1
2001–2002	4	13	2	19	18	1	0
Unit 26B							
1987–1988	2	1	0	3	0	3	0
1988–1989	12	3	0	15	7	7	1
1989–1990	4	7	0	11	3	7	1
1990–1991	15	9	1	25	0	24	1
1991–1992	10	4	3	17	6	10	1
1992–1993	14	11	6	31	5	26	0
1993–1994	17	11	2	30	10	20	0
1994–1995	11	5	0	16	4	12	0
1995–1996	9	3	1	13	2	11	0
1996–1997	14	10	0	24	4	15	5
1997–1998	3	2	0	5	0	5	0
1998–1999	8	7	2	17	1	16	0
1999–2000	14	10	0	24	12	12	0
2000–2001	9	7	0	16	2	13	1
2001–2002	5	2	0	7	4	3	0
Unit 26C							
1987–1988	1	1	0	2	0	2	0
1988–1989	3	0	0	3	0	3	0
1989–1990	1	0	0	1	0	1	0
1990–1991	7	4	1	12	2	10	0
1991–1992	3	2	0	5	0	5	0
1992–1993	3	3	0	6	3	3	0
1993–1994	0	0	0	0	0	0	0
1994–1995	4	1	0	5	2	3	0
1995–1996	1	1	0	2	0	2	0
1996–1997	1	0	0	1	1	0	0
1997–1998	2	0	0	2	1	1	0
1998–1999	6	5	0	11	2	9	0
1999–2000	2	1	0	3	1	0	2
2000–2001	7	9	3	19	14	5	0
2001–2002	3	1	0	4	1	3	0

TABLE 2 Units 25A, 25B, 25D, 26A, and 26B wolf harvest chronology percent by time period, regulatory years 1987–1988 through 2001–2002

Regulatory year	Harvest periods										
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	*n*
Unit 25A											
1987–1988	3	7	0	3	7	7	7	67	0	0	30
1988–1989	0	30	0	10	10	0	10	40	0	0	10
1989–1990	0	21	0	21	14	29	14	0	0	0	14
1990–1991	0	4	0	0	26	13	17	39	0	0	23
1991–1992	8	0	0	12	12	16	12	36	4	0	25
1992–1993	7	4	0	15	7	0	4	59	4	0	27
1993–1994	0	17	0	5	11	39	17	0	0	0	18
1994–1995	0	0	0	12	6	18	23	41	0	0	17
1995–1996	13	29	0	8	21	0	29	0	0	0	24
1996–1997	0	0	0	0	6	18	12	35	29	0	17
1997–1998	0	19	0	0	12	6	0	62	0	0	16
1998–1999	0	11	0	0	28	22	5	33	0	0	18
1999–2000	0	20	0	7	0	27	13	27	7	0	15
2000–2001	4	12	0	4	8	20	40	12	0	0	25
2001–2002	0	38	0	0	15	0	31	15	0	0	13
Unit 25B											
1987–1988	0	0	0	17	17	33	17	17	0	0	6
1988–1989	0	0	0	17	50	8	17	8	0	0	12
1989–1990	0	0	0	20	60	0	0	20	0	0	5
1990–1991	0	0	0	0	20	20	0	60	0	0	5
1991–1992	0	0	0	0	69	8	15	8	0	0	13
1992–1993	0	0	0	0	7	33	27	33	0	0	15
1993–1994	0	0	0	8	25	6	0	8	0	0	12
1994–1995	0	0	0	19	0	44	19	19	0	0	16
1995–1996	0	14	0	0	7	36	29	14	0	0	14
1996–1997	0	10	0	0	30	20	30	10	0	0	10
1997–1998	0	0	0	24	11	6	41	18	0	0	17
1998–1999	0	0	0	0	75	0	13	13	0	0	8
1999–2000	0	0	0	0	5	68	21	5	0	0	19
2000–2001	0	0	0	12.5	38	0	38	13	0	0	8
2001–2002	0	13	0	25	13	25	0	13	13	0	8
Unit 25D											
1987–1988	0	0	0	0	50	33	17	0	0	0	6
1988–1989	0	0	0	0	50	0	50	0	0	0	2
1989–1990	0	0	0	0	42	0	25	33	0	0	12
1990–1991	0	8	0	0	8	8	0	75	0	0	24
1991–1992	0	0	0	0	0	5	21	74	0	0	19
1992–1993	0	0	0	9	18	0	64	0	9	0	11
1993–1994	0	0	0	0	32	26	10	26	5	0	19
1994–1995	0	0	0	25	0	16	22	28	3	6	32

Regulatory year	Harvest periods										
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	*n*
1995–1996	0	0	0	6	23	29	6	35	0	0	17
1996–1997	0	0	0	16	32	26	10	5	10	0	19
1997–1998	0	20	0	0	40	0	20	0	20	0	10
1998–1999	0	0	0	0	0	0	75	25	0	0	4
1999–2000	0	0	0	0	29	43	0	14	0	14	7
2000–2001	0	9	0	0	0	36	18	27	0	9	11
2001–2002	0	0	0	16	32	11	11	11	11	11	19
Unit 26B											
1987–1988	0	0	0	0	0	0	33	33	33	0	3
1988–1989	0	13	0	7	33	0	0	40	7	0	15
1989–1990	18	18	0	27	18	9	0	9	0	0	11
1990–1991	16	8	0	4	0	4	0	4	64	0	25
1991–1992	18	6	0	0	24	12	0	18	24	0	17
1992–1993	3	0	0	0	0	0	3	58	36	0	31
1993–1994	7	13	0	3	0	3	33	23	17	0	30
1994–1995	0	44	0	6	12	0	0	19	19	0	16
1995–1996	0	0	0	8	15	8	15	8	46	0	13
1996–1997	0	4	0	0	17	13	13	46	8	0	24
1997–1998	60	0	0	20	0	0	20	0	0	0	5
1998–1999	6	0	0	0	0	6	18	47	24	0	17
1999–2000	4	0	0	0	4	4	25	42	21	0	24
2000–2001	13	6	0	0	0	6	6	31	37.5	0	16
2001–2002	0	0	0	0	14	29	43	14	0	0	7
Unit 26C											
1987–1988	50	0	0	0	0	0	0	0	50	0	2
1988–1989	0	67	0	0	0	0	0	0	33	0	3
1989–1990	100	0	0	0	0	0	0	0	0	0	1
1990–1991	25	0	0	25	0	0	0	0	50	0	12
1991–1992	100	0	0	0	0	0	0	0	0	0	5
1992–1993	17	33	0	0	0	0	0	50	0	0	6
1993–1994	0	0	0	0	0	0	0	0	0	0	0
1994–1995	20	40	0	0	0	0	0	40	0	0	5
1995–1996	0	50	0	0	0	0	0	50	0	0	2
1996–1997	100	0	0	0	0	0	0	0	0	0	1
1997–1998	0	0	0	0	0	0	0	50	50	0	2
1998–1999	9	0	0	0	0	0	0	36	55	0	11
1999–2000	0	0	0	0	0	0	0	100	0	0	3
2000–2001	10	0	0	0	0	0	16	58	16	0	19
2001–2002	75	0	0	0	0	0	0	25	0	0	4

TABLE 3 Units 25A, 25B, 25D, 26B, and 26C harvest percent by transport method, regulatory years 1987–1988 through 2001–2002

Regulatory year	Method of transportation								
	Airplane	Dogsled, Skis, Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unk	*n*
Unit 25A									
1987–1988	73	7	3	0	17	0	0	0	30
1988–1989	10	20	10	0	60	0	0	0	10
1989–1990	21	29	0	0	36	0	14	0	14
1990–1991	0	13	4	0	70	0	0	13	23
1991–1992	8	8	0	0	72	0	0	12	25
1992–1993	11	0	0	0	78	0	4	7	27
1993–1994	11	0	6	0	83	0	0	0	18
1994–1995	24	0	0	0	76	0	0	0	17
1995–1996	21	38	0	0	38	0	0	4	24
1996–1997	0	0	0	0	100	0	0	0	17
1997–1998	12	19	0	0	69	0	0	0	16
1998–1999	11	0	0	0	89	0	0	0	18
1999–2000	7	7	7	0	80	0	0	0	15
2000–2001	20	4	0	0	76	0	0	0	25
2001–2002	38	8	0	0	54	0	0	0	13
Unit 25B									
1987–1988	0	17	0	0	67	0	17	0	6
1988–1989	0	17	0	0	83	0	0	0	12
1989–1990	60	0	0	40	0	0	0	0	5
1990–1991	20	0	0	0	80	0	0	0	5
1991–1992	0	0	0	0	100	0	0	0	13
1992–1993	7	13	0	0	67	0	0	13	15
1993–1994	0	42	8	0	50	0	0	0	12
1994–1995	0	6	0	0	75	0	0	19	16
1995–1996	0	7	14	0	79	0	0	0	14
1996–1997	0	10	10	0	80	0	0	0	10

Regulatory year	Method of transportation								
	Airplane	Dogsled, Skis, Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unk	*n*
1997–1998	0	47	0	0	53	0	0	0	17
1998–1999	13	13	0	0	63	0	0	13	8
1999–2000	0	37	0	0	63	0	0	0	19
2000–2001	0	0	0	0	100	0	0	0	8
2001–2002	38	13	13	0	13	0	25	0	8
Unit 25D									
1987–1988	0	0	0	0	100	0	0	0	6
1988–1989	0	0	0	0	100	0	0	0	2
1989–1990	8	0	0	0	92	0	0	0	12
1990–1991	54	0	0	0	46	0	0	0	24
1991–1992	58	0	0	0	42	0	0	0	19
1992–1993	9	0	0	0	82	0	9	0	11
1993–1994	11	0	0	0	89	0	0	0	19
1994–1995	9	0	0	0	91	0	0	0	32
1995–1996	0	0	0	0	100	0	0	0	17
1996–1997	5	0	0	0	95	0	0	0	19
1997–1998	40	0	0	0	60	0	0	0	10
1998–1999	0	0	0	0	100	0	0	0	4
1999–2000	14	0	0	0	71	0	0	14	7
2000–2001	0	0	9	0	73	0	9	9	11
2001–2002	16	0	0	0	68	0	0	16	19
Unit 26B									
1987–1988	33	0	0	0	0	0	33	33	3
1988–1989	13	0	0	0	47	0	33	7	15
1989–1990	18	0	0	9	0	0	64	9	11
1990–1991	12	0	0	0	16	0	20	52	25
1991–1992	18	6	0	0	24	0	53	0	17
1992–1993	3	0	0	0	13	0	84	0	31

Regulatory year	Method of transportation								
	Airplane	Dogsled, Skis, Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unk	*n*
1993–1994	10	0	0	0	40	0	48	3	
1994–1995	38	0	6	0	6	0	44	6	16
1995–1996	0	0	0	0	46	0	39	15	13
1996–1997	0	17	0	0	37	0	25	21	24
1997–1998	60	0	0	0	0	0	40	0	5
1998–1999	6	0	0	0	35	0	24	35	17
1999–2000	0	4	0	0	67	0	29	0	24
2000–2001	0	19	13	0	56	0	13	0	16
2001–2002	0	0	0	0	71	0	29	0	7
Unit 26C									
1987–1988	50	0	0	0	0	0	0	50	2
1988–1989	67	0	0	0	33	0	0	0	3
1989–1990	100	0	0	0	0	0	0	0	1
1990–1991	25	0	0	0	75	0	0	0	12
1991–1992	60	0	40	0	0	0	0	0	5
1992–1993	50	0	0	0	50	0	0	0	6
1993–1994	0	0	0	0	0	0	0	0	0
1994–1995	60	0	0	0	40	0	0	0	5
1995–1996	50	0	0	0	50	0	0	0	2
1996–1997	100	0	0	0	0	0	0	0	1
1997–1998	0	0	0	0	100	0	0	0	2
1998–1999	9	0	0	0	91	0	0	0	11
1999–2000	0	0	0	0	33	0	0	67	3
2000–2001	79	5	0	0	16	0	0	0	19
2001–2002	25	25	0	0	25	0	0	25	4

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WOLF MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNIT: Unit 26A (56,000 mi^2)

GEOGRAPHIC DESCRIPTION: Western North Slope

BACKGROUND

Wolf numbers in Unit 26 have fluctuated widely since the turn of the century. During the early 1900s, caribou, moose, and wolves were less abundant than they are today. Caribou and moose numbers increased after 1930, and by the 1940s wolves were abundant. Wolf numbers were greatly reduced by federal wolf control during the 1950s and by public aerial hunting during the 1960s. Following the ban on aerial wolf hunting in 1970 and land-and-shoot aircraft hunting of wolves in 1982, wolf populations increased, especially in the mountains and foothills of the Brooks Range. Wolves are less abundant on the coastal plain because of the seasonal scarcity of caribou, outbreaks of rabies, and their vulnerability to hunters in the open country.

The reported annual harvest of wolves in recent years has ranged from 13 to 60 animals, but the actual annual harvest has ranged from approximately 50 to 120. The pelts of most wolves harvested in Unit 26A are used locally for the manufacture of parka ruffs or handicrafts and often are not sealed. The harvest of wolves is greatest in the southeastern part of Unit 26A where residents of Anaktuvuk Pass and Nuiqsut hunt and trap wolves throughout the winter.

Stephenson and James (1982) estimated the wolf population size for Unit 26A at 144–310 wolves in 1982. Trent (1988) surveyed a 16,848 km^2 (6480 mi^2) area around Umiat and estimated density in 1986 at 2.6 wolves/1000 km^2 and 2.7–3.2 wolves/1000 km^2 in 1987. Carroll (1994) surveyed a 23,293 km^2 (8955 mi^2) using a Traditional Track Count method and a 10,343 km^2 (3994 mi^2) area around Umiat using a Track Intercept Probability technique in 1992 and estimated the density of wolves to be 4.2 wolves/1000 km^2. In 1993 it was estimated that there were 240–390 wolves (1.8–2.9 wolves/1000 km^2) in 32 to 53 packs in Unit 26A (Carroll, 1997).

A Sample Unit Probability Estimator (SUPE) was used in 1994 to count wolves in the 10,343 km^2 (3994 mi^2) study area around Umiat and the density was estimated at 4.1 wolves/1000 km^2. A SUPE survey was completed in 1998 and a density estimate of 1.6 wolves/1000 km^2

was generated. The 1998 survey was incomplete because of poor conditions, but it was apparent that the wolf population had declined (Carroll, 2000).

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Maintain viable wolf populations in Unit 26A.
- Determine impact of wolves on Unit 26A moose.
- Involve the public in developing a management plan and in making future management decisions concerning wolves.

MANAGEMENT ACTIVITIES

- Monitor the population density of wolves in the most heavily hunted area in Unit 26A once every 3 years.
- Monitor harvest through the statewide sealing program by interviewing knowledgeable people in the villages and working with the North Slope Borough (NSB) to develop a more effective harvest-monitoring program.
- Interview hunters, guides, and pilots to collect harvest and population status information.
- Monitor the wolf population by conducting surveys in the primary moose habitat area once every 3 years.
- Record wolf observations during moose counts and compare to observations made during past counts.

METHODS

A Sample Unit Probability Estimator (SUPE) sample design was used to census wolves in a 10,343 km^2 area bordered by the Colville, Killik, and Itkillik rivers and Gunsight Mountain. Surveys were flown using a PA-18 and a Scout aircraft on 15 and 16 April 1998. The study area as divided into 4 x 4 mile sample units. The units were classified into high, medium and low categories; according to the likelihood they contained fresh wolf tracks. We randomly selected units to be surveyed, with proportionally the most units in the “high” category surveyed, “medium” second, and “low” third. We attempted to fly surveys 2 days after a snowfall. Each selected unit was searched thoroughly to determine whether or not fresh wolf tracks were present. When tracks were found we followed them to determine how many wolves were in the pack, and what course the wolves had followed since the last snowfall. A population estimate for the area was obtained using the number of wolves counted and by determining the probability of observing wolf tracks on the survey, which is a function of the number and category of sample units containing wolf tracks. To prepare accurate estimates, a

researcher must not miss any wolf tracks in the selected sample units, correctly identify all sample units that a set of tracks passes through, and correctly enumerate the number of wolves in the packs (Becker, 1998).

We collected harvest data from sealing certificate records and informal discussions with knowledgeable village residents. Harvest data for some villages was obtained through the NSB Harvest Documentation Program that maintains monitoring in North Slope villages. In past years we have obtained composition data from wolf carcasses collected by hunters at Anaktuvuk Pass.

A wolf management plan for the North Slope was developed during 1992 and 1993. In developing the management plan, public meetings were held in North Slope villages, and local governments and federal management agencies were consulted.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Estimates of wolf numbers were not attempted during the reporting period. Previously, we estimated the number of wolves in Unit 26A in 1993. Assuming that most of the coastal plain has a lower wolf density than the foothill region where we surveyed, we estimated that 240–390 wolves (1.8–2.9 wolves/1000 km^2) in 32 to 53 packs were resident in Unit 26A.

A SUPE sample design was used to census wolves in a 10,343 km^2 area bordered by the Colville, Killik, and Itkillik rivers and Gunsight Mountain on 15 and 16 April 1998. Lack of fresh snow and wind blown snow conditions resulted in poor tracking conditions in the southern half of the study area. We concentrated our efforts on the northern 5000 km^2 . Only 7 wolves were seen in 2 packs, resulting in an estimate of 8 wolves, with a confidence range of 5–11 at the 90% level. A density estimate was calculated at 1.6 wolves per 1000 km^2 in the 5000 km^2 area.

Results of surveys (previously reported) indicate the density of wolves increased from approximately 2.6 wolves/1000 km^2 in 1987 to 4.2 wolves/1000 km^2 in 1992 and 4.1 wolves/1000 km^2 in 1994. Although our 1998 survey was incomplete it was apparent that the density of wolves had declined in the area (Table 1).

The number of wolves seen during moose surveys has also declined in recent years. During the spring 1991 moose census 29 wolf sightings were recorded in 39 hours of flight in Unit 26A. During the 1995 survey, 16 wolves were observed during 35 hours of flight. We did not see any wolves during moose counts in 1998, 1999, 2000 or 2001. We saw 4 wolves in 2002.

The most likely reason that wolf numbers in the study area have decreased in recent years is a reduced prey base. The Unit 26A moose population declined by 75% between 1992 and 1996. In addition, very few caribou from either the Teshekpuk Herd or the Western Arctic Herd have wintered in the area between Umiat and Anaktuvuk Pass in recent years. It is also

possible that disease could have been a factor in the decline in wolf numbers.

In order to assist with the recovery of the 40 Mile Caribou Herd, North Slope residents agreed to have 15 wolves relocated from the Tok area to the North Slope in 1999. At the request of local residents the wolves were not collared, so it has been difficult to monitor the survival of the wolves. The relocated wolves did have ear tags and 2 of these were reported harvested by trappers.

Population Composition

No population composition data was collected in Unit 26A during the reporting period. Previously, US National Park Service and department staff collected necropsy data on wolves harvested at Anaktuvuk Pass from the winters of 1985–1986 to 1992–1993. Out of 110 wolf carcasses examined at Anaktuvuk Pass during 1990–91, 73 were from wolves harvested in Unit 26A. Forty-six (42%) were males, 52 (47%) were females, and 12 (11%) were unknown. Of 82 carcasses that were aged, 37 (45%) were adults and 45 (55%) were pups. Ninety-three (85%) of the wolves were gray or white, and 17 (15%) were black. Sixty-seven (61%) of these wolves were shot and 43 (39%) were trapped. Fifteen were caught during December, 23 during January, 23 during February, and 44 during March.

Of 52 carcasses examined during 1991–1992, 35 were from wolves harvested in Unit 26A. Twenty-eight (54%) were males, 23 (44%) were females, and 1 was unknown. Twenty-three (44%) were pups, 15 (29%) were adults, and 4 were of unknown age. Eight (15%) animals were black, 43 (81%) were gray, and one was unknown. Twenty (38%) were shot and 32 (62%) were trapped.

Of the 48 carcasses examined at Anaktuvuk Pass during 1992–1993, 21 were taken in Unit 26A. Ten (48%) were males, 2 (10%) were females, and 9 were unknown. Twelve (57%) were shot and 9 (43%) were trapped. All were gray.

No composition data was available from Anaktuvuk Pass after 1993. Composition of the harvest probably does not reflect accurate age composition because pups are more susceptible to harvest than adults. Composition data from sources other than hunter harvest are not available at this time.

Distribution and Movements

Most wolves are in the southern portion of Unit 26A in the Brooks Mountain Range and foothills and along the Colville River system. However, residents have seen wolves in increasing numbers on the coastal plain during recent years. Wolves often move toward areas of high caribou concentration. For instance, during the winters of 1990–1991 and 1993–1994, many caribou concentrated near Anaktuvuk Pass, which attracted wolves and resulted in a large wolf harvest.

MORTALITY

Harvest

Season and Bag Limit.

Area	Bag limit	Season
Unit 26A:		
Trapping	No limit	1 Nov–15 Apr
Hunting	10 wolves	10 Aug–30 Apr

Board of Game Actions and Emergency Orders. The Board of Game had made it legal under trapping regulations to shoot a wolf the same-day-airborne if the wolf is either caught in a trap or snare or over 300 feet from the airplane at the time of taking. In 1999 a citizen referendum made it illegal to hunt wolves the same-day-airborne.

Hunter/Trapper Harvest. During the 1999–2000 season, 8 wolves were sealed; during 2000–2001, 29 wolves were sealed; and during 2001–2002, 16 wolves were sealed. For percentages of males and females and colors of wolves see Table 2.

Previous harvests have been documented by the NSB Department of Wildlife Management Harvest Documentation Project. The NSB found during 1994–1995 that at least 59 wolves were harvested in Anaktuvuk Pass while 17 were sealed. Eighteen were harvested in Nuiqsut, 2 in Atqasuk, and 8 in Kaktovik while none were sealed in any of those villages (Brower and Opie 1996,1997; Hepa and Brower, 1997).

Permit Hunts. There were no permit hunts for wolves in Unit 26A during the reporting period.

Hunter Residency and Success. In 1999–2000, 5 North Slope residents harvested 7 wolves and 1 wolf was reported harvested by a nonresident hunter. During 2000–2001, 8 North Slope residents harvested 25 wolves, a nonlocal resident harvested 2 wolves, and 2 nonresidents harvested a total of 2 wolves. In 2001–2002, 3 North Slope residents harvested 12 wolves and a nonlocal resident harvested 4 wolves. There is no information on the number of unsuccessful hunters.

Method of Take, Transportation, and Chronology. The method of take, transportation, and chronology are summarized in Tables 3 and 4.

Other Mortality

We have no information to report on other sources of mortality.

HABITAT

Assessment

Unit 26A contains extensive open habitat and a large seasonal prey base available to wolves. The Western Arctic Caribou Herd (WAH), which numbers over 450,000 animals, seasonally occupies parts of Unit 26A and a portion of this herd remains throughout the winter. The

Teshekpuk Caribou Herd (TCH) numbers over 45,000 animals, and most of this herd remains in the unit during most years.

The Colville River moose population numbered approximately 1600 by 1991 but declined by 75% between 1992 and 1996; this consistent prey base has been greatly reduced but is now recovering. Dall sheep are preyed upon in mountainous regions, but also declined in the 1990s. Snowshoe hares have moved into the Colville River system during the 1990s and increased dramatically, providing another food source for wolves.

Petroleum exploration and development may affect some wolf habitat. Hunter/trappers have reported that wolves move out of areas of Unit 26A when seismic exploration is taking place.

Enhancement

There were no habitat enhancement activities for wolves in Unit 26A during the reporting period.

CONCLUSIONS AND RECOMMENDATIONS

The results of wolf population surveys indicate that the density of wolves in the southeast corner of the Unit 26A increased from 2.6 wolves/1000 km^2 in 1986 to 4.2 wolves/1000 km^2 in 1992 and 4.1 wolves/1000 km^2 in 1994, but declined to 1.6 wolves/1000 km^2 in 1998. The number of wolves seen during moose surveys has also declined.

Wolf numbers in the study area have decreased because of a reduced prey base. The Unit 26A moose population declined by 75% between 1992 and 1996. In addition, very few caribou from either the Teshekpuk Herd or the Western Arctic caribou herd have wintered in the area between Umiat and Anaktuvuk Pass since 1997.

We have not conducted counts in other areas of Unit 26A, but the number of wolves sealed throughout the unit has decreased in recent years. Assuming that hunting pressure has stayed the same, this would indicate that there has been a decline in the wolf population throughout Unit 26A. Hunter/trapper harvest and disease in the wolf population have also contributed to the decline in wolf numbers.

Because many North Slope residents tan their wolf pelts at home and do not have them sealed, the department's wolf sealing program does not provide accurate harvest information. Department personnel have been assisting the NSB develop a harvest documentation system that is more acceptable to local residents. Harvest monitors have been hired in each village and are collecting harvest information for several species. During 1994–1995 the NSB found that at least 59 wolves were harvested in Anaktuvuk Pass while 17 were sealed and that 18 were harvested in Nuiqsut while none was sealed. We will have more accurate harvest information if the NSB program continues and becomes established in more North Slope villages.

A wolf management plan for the North Slope was developed during 1992 and 1993. In developing the management plan, public meetings were held in North Slope villages, and

local governments and federal management agencies were consulted. Most local people agreed that 1) a moderate level of harvest of wolves should continue, 2) wolf pelts are highly prized and are a valuable resource for North Slope residents, 3) wolf control is unnecessary on the North Slope at this time, 4) residents oppose using aircraft to harvest wolves, and 5) if wolf populations become too large, local people could use ground hunting methods to control the populations.

Wolf predation has been a factor for both Dall sheep and moose populations in Unit 26A. Sheep populations declined in number throughout the Brooks Range in the early to mid 1990s, and hunters reported finding the remains of many sheep that apparently were killed by wolves in the mountains. The Colville River moose population also declined by 75% between 1992 and 1996. Several factors were involved in this decline, one of which is wolf predation. The moose population has begun to increase since 1997 while the density of wolves has been low. It is difficult to determine whether the wolf density is driving the moose population fluctuation or if the wolves immigrated to the area in response to high moose and caribou numbers and left when the numbers of prey animals declined. We will continue to conduct wolf and moose surveys to monitor the impact of hunters on wolves and the combined impact of hunters, bears, and wolves on moose.

In order to assist with the recovery of the 40 Mile Caribou Herd, North Slope residents agreed to have 15 wolves relocated from the Tok area to the North Slope in 1999. At the request of local residents, the wolves were not collared, so it has been difficult to monitor the survival of the wolves. The relocated wolves did have ear tags and 2 of these were reported harvested by trappers.

Although the wolf population has declined in Unit 26A, I recommend no changes in bag limits or seasons at this time. The decline in wolf density in the study area appears to be more related to a reduced prey base than it is to hunting pressure. The Unit 26A moose population is currently recovering; and, if caribou become more plentiful in the area, wolf numbers will also be more abundant. Because aerial and land-and-shoot hunting are not allowed, extensive areas in Unit 26A receive little hunting pressure. Except for the area within 50–70 miles of Anaktuvuk Pass, much of the wolf population inhabiting the foothills and mountains of the Brooks Range probably will not be heavily hunted or trapped. Hunters from other North Slope villages range over much of the coastal plain where wolves probably will not become plentiful.

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Table 1 Wolf population estimates for Unit 26A and the Colville River study area, 1982–1998

	Colville River Study Area[a]		Unit 26A		
Year	Wolves per 1000 km^2	Number of packs	Population estimate	Number of packs	Basis of estimate
1982			144–310		TTC survey[b] and extrapolation to rest of unit.
1986	2.6	2			TTC survey[b]
1987	2.7–3.2	4–5			TTC survey[b]
1990			145–350	14–30	Past surveys and interviews with pilots and hunters.
1992	2.9–4.2	4–8			TTC survey[b]
1992	4.0–6.2	5–8			TIP survey[c]
1993			240–390	32–53	1992 surveys and interviews with pilots and hunters.
1994	4.1–4.3	8–10			SUPE survey[d]
1998[e]	1–2.2	2			SUPE survey[d]

[a] Colville Study Area - southeast portion of Unit 26A bordered by the Colville, Killik, and Itkillik Rivers and the Brooks Range.
[b] Traditional Track Count survey.
[c] Track Intercept Probability survey.
[d] Sample Unit Probability Estimator surveyee
[e] Incomplete survey due to poor snow cover.

Table 2 Sex and color of wolves from reported harvests and estimated unreported harvest, Unit 26A, 1989–2002

Regulatory year	Sex			Color			Estimated unreported harvest	Total reported harvest
	% Male	% Females	% Unknown	% Gray	% Black	% White		
1988–1989	38	62		100	0	0		13
1989–1990	71	29		64	29	7	48	14
1990–1991	66	34		83	13	3	82	30
1991–1992	67	28		72	22	6	37	18
1992–1993	59	30	11	79	17	3	42	29
1993–1994	65	32	3	72	17	11	37	60
1994–1995	73	27	0	89	6	5	32	47
1995–1996	42	58	0	85	9	6	41	19
1996–1997	57	43	0	81	14	5	40	21
1997–1998	75	25		69	31	0	30	16
1998–1999	60	33	7	67	13	20	28	15
1999-2000	50	13	37	37	50	13	25	8
2000-2001	83	14	3	76	21	3	32	29
2001-2002	75	25		88	6	6	30	16

Table 3 Method and transportation percent of reported wolf harvest, Unit 26A, 1988–2002

Regulatory	Method of take (%)				Transportation method (%)				Total reported
Year	Trap	Rifle	Snare	Unknown	Aircraft	Snogo	ORV	Boat/Skis	harvest
1988–1989	15	85				100			13
1989–1990	64	36			15	85			14
1990–1991	20	80			3	90	7		30
1991–1992	39	61			6	94			18
1992–1993	30	63		7	7	89	4		29
1993–1994	33	66	1		8	85	0	7	60
1994–1995	7	90	3		28	72			47
1995–1996	21	74	5			95		5	19
1996–1997	71	29			5	95			21
1997–1998	0	100			0	100			16
1998–1999	0	100	0		13	87			15
1999-2000	0	63		27	80	20			8
2000-2001	4	96	0		7	86		7	29
2001-2002	0	100	0		0	100			16

Table 4 Chronology for reported wolf harvest in Unit 26A, 1988–2002

Regulatory	Month											
Year	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Unknown	Total
1988–1989	1				1		2	9				13
1989–1990		2		1	2	2	2	5				14
1990–1991		1			3			22	4			30
1991–1992		1				2	1	11	3			18
1992–1993		2		2	2			18	4		1	29
1993–1994	2	5		1	4	2	5	29	12			60
1994–1995	2	2		3	5	2	10	13	10			47
1995–1996		1		3				11	1	3		19
1996–1997	1		1		1	4	11	3				21
1997–1998				2	5	3	1	5				16
1998–1999	1	1				1	4	5	3			15
1999-2000		1		2			3				2	8
2000-2001	2		3		2	1	9	8	4			29
2001-2002			2		3		7	4				16